CRANFIELD UNIVERSITY

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Public views on drought mitigation: Evidence from the comments sections of on-line news articles

School of Applied Sciences
MSc by Research in Water Sciences

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ABSTRACT

During the spring of 2012 much of the south-east of England was under water use restrictions, as a result of two consecutive dry winters. The drought highlighted the region's vulnerability to this natural hazard and emphasized the issues associated with water shortages and the need for drought mitigation measures. This research has sought to examine the public responses to interventions that help alleviate drought, and the drivers that influence those responses. Historically, public responses to such interventions have been complex, and acceptance has not been guaranteed. Drought events are likely to become more frequent in the future, therefore, understanding how and why the public responds to interventions is increasingly important. Such insights can help governments and other authorities in planning for future drought events. The study utilised qualitative content analysis of online news articles and their associated comments (opinions and perspectives) from readers. This method was selected to explore the meanings underlying the readers' comments, thus enabling a better understanding of reader's perspectives and how they viewed their social world. The key findings indicate that at this point in time, the reader's emphasised supply side interventions over water conservation measures. Still, readers were not unwilling to conserve water; many were actively reducing their water consumption by engaging in water saving behaviours and installing water saving equipment. The findings indicate that lack of trust in the water companies was a major influence on responses to the drought and to potential interventions for easing the drought such as the hosepipe ban. Equally, the data showed that some readers lacked knowledge and understanding around what interventions entailed, for instance desalination. This study highlights the need for clear communications between authorities and the public. The water companies need to rebuild relationships and regain public trust by providing transparent, timely communications about their role and function as water suppliers, together with the provision of impartial, factual information on the variety of drought interventions available, so the public can make informed choices.

Keywords: water shortages, water management, drought alleviation, media analysis.

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LIST OF ABBREVIATIONS

AD	Anaerobic Digestion
AFV	Alternative Fuelled Vehicles
AWS	Alternative Water Sources
CIWEM	Chartered Institution of Water and Environmental Management
CHP	Combined Heat and Power
CU	Cranfield University
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EEA	European Environment Agency
NGV	Natural Gas Vehicles
OECD	Organisation for Economic Co-operation & Development
OFWAT	The Water Services Regulation Authority
PV	Photo Voltaic
ROCS	Renewable Obligation Certificate
SE England	South East England
SEAS	Subjective Effectiveness of Alternative Solutions
SUDS	Sustainable Urban Drainage Systems
UK	United Kingdom
UN Water	United Nations Water
USA	United States of America
WWF	World Wildlife Fund
WRAP	Waste & Resources Action Programme

1 Introduction

Water availability is becoming a concern throughout the world as drought events become more frequent. Recent climate change models predict that seasonal rainfall is likely to decrease across large areas of southern Europe, Africa and Central Asia (Arnell, 2008). As the world's population increases, and, with it, urbanisation, demand for water will increase, making water scarcity more prevalent. Indeed, it has been estimated that over half of the world's population will be affected by water scarcity by 2030 (UN Water, 2012).

Water scarcity occurs when demand outstrips the available water and is a consequence of both natural and man-made phenomena (European Environment Agency (EEA), 2008). Therefore, contrary to popular belief, water scarcity occurs even in countries with high rainfall. For instance, the UK is renowned for ample rainfall but most of this falls in the North of the country, while the South of England, which has a larger, growing population and an increasing demand for water, is vulnerable to water shortages (Bell, 2009; Doron, 2011). Water scarcity also occurs due to a range of man-made factors including poor water management practices, pollution, tourism, intense agriculture, industries dependent on large amounts of water, wastage and urbanisation (EEA, 2008).

Drought and water restrictions not only affect water availability to householders, they also have serious consequences for agriculture, energy and tourism, causing serious environmental, social and economic problems. For example, low water levels can impact breeding wildlife which inhabits natural water courses. Water shortages can hamper energy and food production which in turn can lead to increased energy and food prices (BBC News Online, 2012b). A recent European Commission study found that droughts in Europe have cost the economy €100 billion over the last 30 years (European Commission, 2012).

1.1 Statement of the problem

An aging water infrastructure coupled with an increase in drought events across Europe highlights the need for effective water resource management to ensure there is sufficient quality and quantity of water to meet needs. Effective water resource

management and drought mitigation require major investment in infrastructure in addition to a reduction in water consumption (Bell, 2009), thus the public plays a role in ensuring its success.

Drought mitigation often relies on innovative means of managing water including new technologies, policies, management tools and encouraging behaviour change. Yet previous studies have shown that public response to interventions[1] has been diverse, with some interventions such as domestic water saving appliances being more readily accepted (Millock and Nauges, 2010), while others, such as the use of recycled water, are more likely to be resisted (Dolnicar and Hurlimann, 2009). As drought events are likely to become more frequent in the future, it is becoming increasingly important to gain a better understanding of the variety of public responses to drought interventions as well as the underlying reasons and drivers behind those responses.

1.2 Background and context of the research

On April 5th 2012 seven water companies in England (Anglian Water, Thames Water, Southern Water, South East Water, Sutton & East Surrey, Veolia Central and Veolia South East) imposed a hosepipe ban on their customers due to two consecutive dry winters. The water restrictions included a ban on activities such as watering gardens, washing cars, windows, paths or patios with a hosepipe, and filling paddling pools, swimming pools or ornamental fountains. Anyone who breached the hosepipe ban would potentially have to pay a £1000 fine (Cohen, 2012). Figure 1-1 below illustrates a drought risk map for England and Wales in January and February 2012.

[1] Chapter two the literature review focusses on public response to 'innovation' in the water, energy and waste sectors. The remainder of this thesis uses the term 'intervention' rather than 'innovation' and is defined by the author as a 'measure(s) provided to improve a situation'. This term was selected because many of the measures examined to help alleviate the drought were suggested by the public and as such could not technically be claimed as being innovative to their audience.

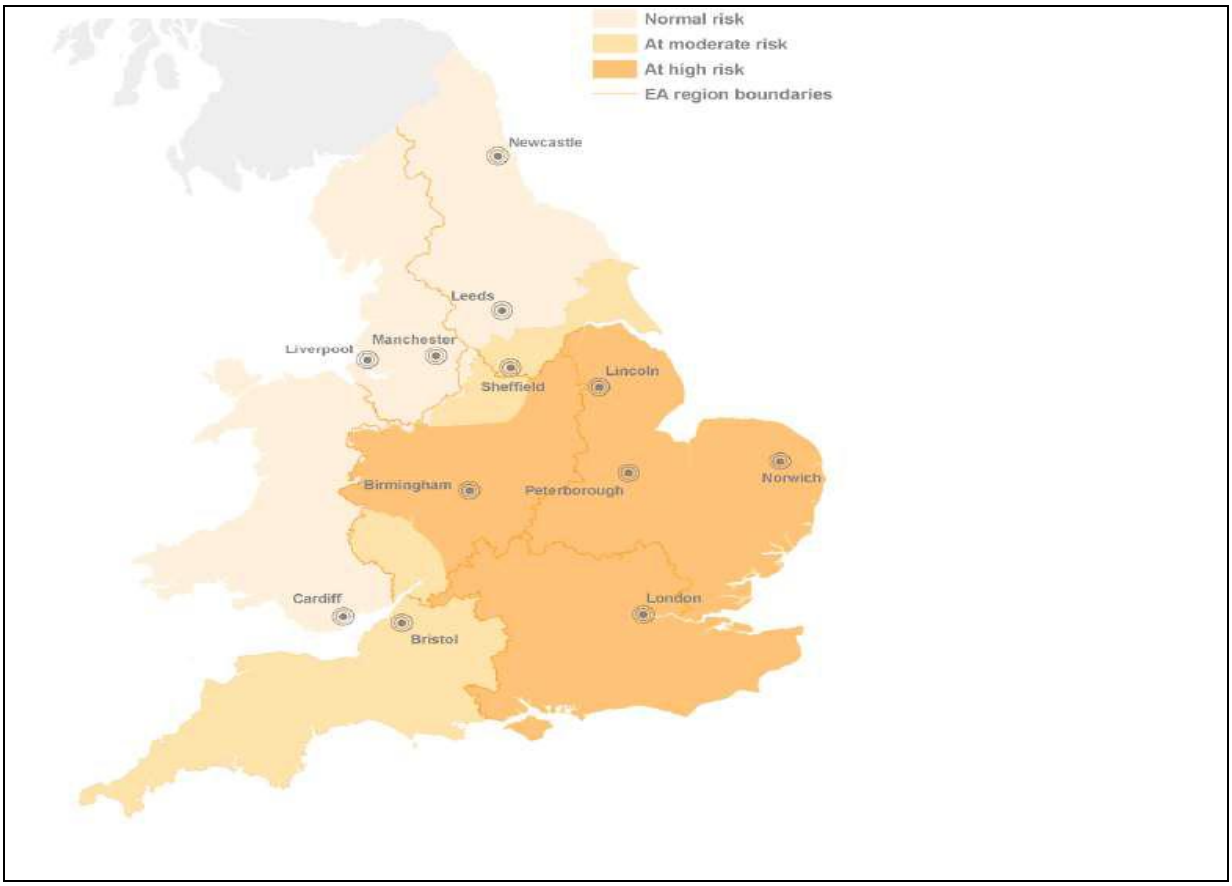

Figure 1-1 Drought risk map for England & Wales, 2012 (Source: Environment Agency, 2012)

The drought and hosepipe bans were major news stories during the spring and summer months and newspapers were filled with drought stories and photographs of low reservoirs and dry river beds. In particular, there was prolonged discussion regarding empty reservoirs in South–East (SE) England, water saving tips and other interventions to alleviate the drought such as major infrastructure development (Rao, 2012). Online newspapers and broadcasters encouraged readers to provide their feedback and thoughts on the proposed ban via comment sections on their websites. On-line comment sections of newspapers and broadcasters provide a useful forum for public discussion and debate (Manosevitch and Walker, 2009) which can reflect the wider social and cultural considerations that may be overlooked by water companies and other authorities (Bell, 2009).

Traditionally, water companies have responded to drought events by expanding their water supply infrastructure (Bell, 2009). Today, drought management plans involve both supply side strategies and demand side strategies as possible solutions. Supply side strategies include building more reservoirs and drilling wells, in addition to providing alternative water sources such as storm water, desalination and water recycling (Dolnicar *et al,* 2011). Countries such as the UK and Germany are also considering greywater utilisation to help with drought mitigation and environmental conservation (Domenench and Sauri, 2010). Demand side strategies include increasing the efficiency of appliances and water conservation (Dolnicar *et al,* 2009). Water consumed by showers, toilets, washing machines and sprinklers represent a significant share of households' daily water used in the developed world (Millock and Nauges, 2010). Hence, in recent years the public has been encouraged to retrofit their houses with water saving equipment such as dual-flush toilets, water efficient shower heads and rainwater tanks, as well as water saving appliances such as washing machine and dishwashers. The volume of water that can be conserved by these simple and relatively inexpensive measures is now well acknowledged (Millock and Nauges, 2010). However, public responses to such interventions is complex and varied. For example, research in Taiwan by Lam (2006) revealed that retro-fitting homes with dual-flush toilets was in part dependent on higher household income. In addition, responses can be influenced by pre-existing opinions and knowledge, so acceptance of drought mitigation interventions is not guaranteed.

1.3 The purpose of the study

The purpose of the study reported here was to provide a qualitative assessment of the general public's views on drought interventions and to identify the factors that influence those responses. The research explored online news articles and their associated comments (opinions and perspectives from the public), that were reported and written following the announcement of a hosepipe ban for SE England. The project explored the range of interventions suggested by the public and the media including those that help consumers save water such as water saving appliances and equipment and water conservation behaviours. It also explored the responses to alternative water sources such as greywater, desalination and recycled

water. These interventions have different outcomes; water saving interventions and changing behaviours save water, whilst alternative water sources increase the volume of water available. Nevertheless, in the context of integrated water management, both are utilised as management tools to ease drought and build sustainable water systems.

Learning and understanding how the public views the issues related to drought mitigation measures, (from the public perspective rather than by imposing the views of the water companies or other authorities) generates valuable insights regarding possible future drought mitigation plans. Hence, the study is important as it has implications for policy makers, water companies, agencies, educational programmes and communication campaigns in planning for future drought events and future management plans.

1.4 Research questions

The research addresses the following research questions:

1. How are drought mitigation interventions characterised and discussed in UK news articles and public comments?

2. What are the key drivers influencing these responses to drought interventions?

1.5 Definition of terms

The following definitions (developed by the researcher) are provided to ensure uniformity and understanding of these terms throughout this study.

Authorities - refers to representatives from the water companies, the government, the Chartered Institute of Water and Environmental Management (CIWEM), the World Wildlife Fund (WWF), the Environment Agency (EA) and the Department for Environment, Food and Rural Affairs (DEFRA).

Driver of response - refers to the underlying reasons that influence how and why a person responds to an innovation in a particular way. In this study drivers of

response include but are not limited to concepts such as ‘knowledge and information’ ‘fairness’ and ‘trust’.

Intervention - is defined as a ‘measure(s) provided to improve a situation’.

Readers - refers to members of the public who posted a comment(s) in the comment sections of associated online news articles selected for this research.

Response (to innovation) - refers to the public reaction to an innovation; it can be verbal, behavioural or an action response. In this study responses include but are not limited to ‘adoption’, ‘acceptance’, ‘resistance’, and ‘apathy’.

1.6 The scope and limitations of the study

The scope of the study was restricted to online news articles and their comment sections from the UK. The data was collected from seven national newspapers and broadcasters. The study focussed on the drought event that occurred in Spring 2012, and specifically it comprised articles published between 1st February 2012 and 30th April 2012. The study concentrated on public responses to drought interventions rather than an institutional perspective (businesses, authorities), in order to focus on the opinions and perceptions of consumers’ views at a household rather than institutional level, which may have a different agenda.

The limitations of the study were as follows. Owing to the manner in which the data was collated as discussed above, and the fact that it was secondary data, it was not possible to provide socio-economic and demographic information regarding the participants of the study. An ACORN analysis could have been carried out but it would have resulted in an educated guess rather than explicit, verifiable evidence.

Furthermore, the researcher had no control over the sample population used in the study and it was not possible to ascertain if accurate representation of the general population was achieved. However, it is assumed that due to the use of a wide selection of newspapers and broadcasters and the fact that the final articles were

randomly selected, the study is likely to be broadly representative of the general population. A mixed method approach may have provided more depth and breadth to the findings and interpretations; however, the study was limited by practical constraints of location, time and resources available.

1.7 Organisation of the study

This chapter has introduced the research topic, specifically public response to interventions to alleviate drought, and provided an overview of the research. It discussed the statement of the problem, and the background and context of the research. Also included was the purpose of the study, and the research questions that will form the foundations of the study. It concluded with the scope and limitations of the study. Chapter Two introduces and examines the literature on public response to innovation in the water, waste and energy sectors. Chapter Three outlines the methodology that was used to collect data, from which the conclusions of this research will be drawn. Chapter Four presents the findings from data collated from the online articles and comment sections and discusses and interprets the findings. Chapter Five presents the conclusions regarding public response to interventions to help alleviate drought, and offers insights and recommendations regarding the ways this may impact future drought management plans.

2 Literature Review - Public Response to Innovation in Water, Energy and Waste

2.1 Introduction

This chapter reviews the history and evidence of responses to innovation in the water, waste and energy sectors. These sectors were chosen because in recent years the public have been urged to become more responsible for reducing waste, and conserving water and energy in their homes (Gilbertson *et al,* 2011, WRAP, 2008, Tonglet *et al,* 2004). This change is due in part to rising costs and availability of water and energy, and of waste disposal costs; it is also as a result of a movement towards sustainability. Thus, the sectors share strong parallels regarding the future requirements and management of resources, as well as a variety of public responses to innovations. Responses to innovation from each of the sectors will be explored to ascertain similarities and differences. The terms, phrases and language used to describe responses to innovations will also be examined to determine if a common language emerges.

Innovations in science, agriculture, manufacturing and communications have been a major source of social and economic change, (Vollenbroek, 2001) that has led to the development of the modern world. Today, more than ever, there is a tendency to rely on innovations to solve problems (Godin, 2008) and, in particular, to solve the environmental issues facing society. However, caution should be exercised as sole reliance on innovations as the panacea to eliminate the environmental problems that society faces would not be prudent. This is because public response to innovation is complex and varied; many authors have argued that acceptance and implementation of an innovation by society is fundamental to an innovation's ability to solve a problem, (Marks, 2006; Russell and Hampton, 2005; Dolnicar and Hurlimann, 2010a), yet acceptance is not guaranteed.

Responses to innovations in the water, waste and energy sectors are of particular interest, because even though water supply, waste disposal and energy provision are vital everyday services in developed countries, they are rarely given any consideration by citizens, unless there is a disruption in the service (Techneau,

2007). It is only in recent times with the occurrence of more frequent drought events and water scarcity (Postel, 2000), threats of diminishing energy resources (Achterberg *et al*, 2010) and concern regarding waste management (Barr *et al,* 2001) that they have become visible to the public and the subject of public discussion. Moreover, the management of water, energy and waste has become increasingly challenging due to a rapid increase in population, expanding urbanisation and climate change.

To help combat some of these challenges, companies and governments around the world have been developing new technologies, implementing policies and encouraging behaviour change that contribute to solving water scarcity, energy supply and waste management concerns. Even though innovative solutions are increasingly becoming part of people's daily lives, public response to such innovations has been diverse. Exploring how the public understands, perceives and makes decisions regarding innovations in water, energy and waste management, is central to developing and implementing successful change. As previously mentioned there are strong parallels in each of these sectors regarding the future requirements, attainment and management of these vital resources; for example many countries today are implementing renewable energy infrastructures such as wind farms and solar panels to augment energy supplies (Sovacool, 2009), and water companies are considering alternative sources of water to augment supply (Hurlimann, 2007). In recent years many countries have made concerted efforts to implement waste reduction and recycling schemes to help reduce the amount of waste going to landfill and to protect finite resources (Vincente and Reis, 2008). Moreover, the public is becoming increasingly aware of the adaptation required to ensure the security of these vital services for the future. Thus, an understanding of public responses to innovations in the water, energy and waste sectors is valuable.

In order to make a comparison a number of specific areas of innovation are considered in detail; these are alternative water sources, water conservation, alternative fuelled vehicles, micro-generation technologies, waste recycling, and waste minimisation. These areas are chosen because there are strong parallels between them; they are comparable because they share similar characteristics. For

instance, they share a common goal, which is to help alleviate dependence on natural resources by their adoption and implementation by society. Likewise, they illustrate the types of choices that consumers face. For instance, it is ultimately an individual consumer's choice to buy an alternative fuelled vehicle, install a micro-generation technology in their home or to conserve water. These are personal, considered choices. In contrast consumers may have less control and choice over innovations such as the use of recycled water, so even if consumers have been actively engaged in the decision making process, the innovation choice can be made for the good of the whole of the community.

There is a large body of academic and commercial work on innovation and response to innovation in water, energy and waste, with adoption and resistance being the dominant themes (Ram, 1987, Ram and Sheth 1989). One criticism of the earlier literature is that other forms of responses (for example acceptance, social acceptance, apathy and rejection) are poorly covered. This review will bring together the different sets of literature to examine them holistically. Section 2.2 explores perspectives on innovation, while Section 2.3 will define the terms of response and examine actual responses to innovations. The next section (2.4) will examine the drivers that influence responses to innovation. Section 2.5 will include a discussion of the key findings of the literature review and will illustrate the taxonomy of responses generated from the literature review.

Response to innovation refers to the public reaction to an innovation; it can be verbal, behavioural or an action response. In this study response included terms such as 'adoption', 'acceptance', 'resistance', and 'apathy'. The term driver of response refers to the underlying reasons that can influence how and why a person responds to an innovation in a particular way. For instance, one of the underlying reasons that consumers resist an innovation is if it requires a change in the consumer's behavioural patterns or habits or if it conflicts with their personal beliefs (Kleijen *et al,* 2009). Conversely, if an innovation is seen to be consistent with existing value, habits and past experiences, it is more likely to be adopted (Tornatsky and Klein, 1982, cited in Kleijen *et al,* 2009). In this review drivers of response were both stated and implied.

The review draws on material from a diverse range of disciplines which examine innovation including social marketing, environmental management, resource management and environmental psychology. Consequently, there were many different methodologies used in the literature by researchers investigating public attitudes and preferences to innovations in water, energy and waste, including qualitative methods such as focus groups and in-depth interviews, and quantitative methods such as surveys and questionnaires. This variety of methodologies made it challenging to analyse the data in a comparative framework, because not all data collection methods produce the same format or nature of response. For example, apathy was mentioned in some studies but others did not include it, hence the methodologies preclude direct comparison of the findings. Subsequently, the variety of methods used in the reviewed studies will have had an effect on the study findings and consequently on the taxonomy of response that has been developed.

The following key questions will be addressed in this review:

- What is the nature and level of variation in public response to innovation across the chosen examples?
- Are the responses to innovation sector specific or can they be generically categorised?
- Does the nature of public response to innovation change through time and, if so, is there a clear reason why?

The search strategy for conducting the literature review was as follows: A search vocabulary was defined (refer to Appendix A). Next, sources were selected and included a variety of online journals (refer to Appendix B), books and additional sources such as government documents, conference papers, newspaper articles, citations, EU documents, references from reference sections of papers and websites. The main databases used for the literature research were Scopus, Environment Complete, Science Direct and Google Scholar. Papers were selected using the following criteria, (i) date of research paper, from 1960 to the present day (ii) research method(s) used (iii) nature of what was being studied, for example innovation, resistance, behaviour, alternative water sources, water conservation, alternative fuelled vehicles, micro-generation, waste recycling, and waste

minimisation (iv) papers were selected from across the globe. The following topics were out of scope: sitting sites, wind farms, carbon capture storage, nuclear and waste from energy plants. Refworks were used to catalogue references. A record of what was searched and how it was searched was documented in Word software documents.

2.2 Perspectives on innovation and response to innovation

Innovation is a term that has become embedded in everyday language (Godin, 2008; Fagerberg and Verspagen, 2009) and it is considered by some as a recent phenomenon, however, it (the practice on innovation) has been in existence for centuries (Smits, 2001). What has changed is the way in which the word is used (Godin, 2008). Innovation is more often used to describe a technological innovation/invention/novelty in a commercial sense; this is highlighted by the many new departments and institutes that have sprung up focusing on innovation (Fagerberg and Verspagen, 2009). Still, the concept of innovation is much broader than simply technological; Godin (2008, pp. 43) advocates the following description: 'Innovation concerns any kind of novelty: artistic, scientific, technological, organizational, cultural, social or individual'. His description is useful because it highlights the kaleidoscope of disciplines that innovation can encompass.

There are a variety of other definitions used in the literature to describe innovation. The marketing literature defines innovation as an 'idea, practice or object that is perceived as new by an individual or other unit of adoption' (Rogers, 2003, p 12). The OECD (1991) defines a technological innovation as an 'iterative process initiated by the perception of a new market and/or new service opportunity for a technology based invention which leads to the development, production and marketing tasks striving for the commercial success of the invention' (cited in Garcia and Calantone, 2002, pp. 112). Environmental innovation is defined as 'a product, production process, service or management or business method that is novel to the organisation (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resource use (including energy use) compared to relevant alternatives' (Kemp and Pearson, p.7 cited in van den Bergh *et al,* 2011, p3-4). The common factor in each of these

definitions is that innovation entails some degree of newness. This concept of newness can be further delineated as ‘radical’, ‘really new’, and ‘discontinuous’ in addition to ‘modular’, ‘improving’ and ‘evolutional’ (Garcia and Calantone, 2002, Heiskanen *et al*, 2007). The first three of these terms describe those innovations that ‘break with tradition’ (Heiskanen *et al,* 2007, p. 490), hence Ram and Sheth (1989) claim they may be more inclined to resistance when first introduced into the market. The last three refer to existing innovations that have been modified (Garcia and Calantone, 2002) and hence may be less prone to resistance.

Beyond the common concept of newness, the definitions differ greatly; nonetheless this variety of definition for innovation reflects the widespread applicability and importance of innovation to many industries and disciplines. For instance, the marketing literature definition regards innovation as a definitive article. In contrast, the new product literature and environmental innovation literature refers to innovation as a sequence of distinct units or processes. The environmental innovations literature augments its definition of innovation by referring not only to the innovation itself but also to the impact the innovation is expected to achieve, which could make evaluation of success of the innovation easier. While a variety of definitions of the term innovation have been suggested, this review will adopt the definition by Rogers (2003) because it is broad enough to include not only physical products but behavioural change as well.

The following section reports theory and the evidence base for public response to innovations in those areas listed in section 2.1. The various terms and phrases used to describe different forms of response are distinguished and their relationships explored with a view to generating a useable taxonomy of response evidenced through the literature.

2.3 Public responses to innovations across the water, energy and waste sectors

The forms of responses explored through the review can be grouped into fourteen categories: adoption[2], acceptance, approve, favour, positive reception, compliance, social acceptance, apathy, inertia, indifference, resistance, rejection, postponement and opposition. These headings will be used as a framework to describe and discuss the reviewed literature.

Adoption

The term adoption has been defined as a decision 'to make full use of an innovation' (Rogers, 2003, p. 177) and has been more loosely described as 'the successful introduction of an invention in society' by Vollenbroek (2002, p. 216). For this review the former definition is the better one because it refers not only to embracing the innovation but also to the implementation of the innovation by society. In contrast, the key problem with the latter definition is that while it implies that the innovation is familiar to the public, it makes no reference to the innovation being used by society.

Approve, favour and positive reception

The terms 'approve', 'favour' and 'positive reception' have been included in the taxonomy because they were used by different researchers to refer to support for an innovation in the literature reviewed (definitions of the terms were absence). For instance, Sovalcool (2009) refers to public favour of renewables in the USA in the early 1970s. However, unlike adoption the term does not make any inference to commitment to the innovation nor implementation of the innovation. In other words, a person can approve, be in favour or have a positive reception to an innovation 'without doing anything significant about it' (Coetsee, 1999, p. 211). For this study 'approve', 'favour' and 'positive reception' have been defined by the author as 'positive support for an innovation'. However, they do not guarantee a commitment to implement the innovation.

[2] In the waste recycling literature the term 'participation' in a recycling scheme is more commonly used than term 'adoption'

Acceptance, compliance and social acceptance

Many authors have used the term ‘acceptance’ when describing support for a product, implying positivism or a willingness to receive the product (Van Meegeren, 2001; Hills *et al,* 2002; Barr *et al,* 2001). However, the disadvantage with the term ‘acceptance’ is that it can have overtones of negativity about it inferring mere tolerance; this view is supported by the authors of the Techneau report (2007, p. 4) who refer to acceptance as an ‘affirmative answer to a proposal’ and as a ‘submission to an innovation’. For this review the latter definition is the better one because it refers not only to a level of support for the innovation but also reflects the overtones of tolerance that can be associated with the term ‘acceptance’.

According to Van Meegeren, (2001) acceptance of a measure (in particular an environmental policy), depends on what those affected by the measure think of it; he argues that a measure will be accepted by an individual if their attitude towards it is positive or neutral. Consequently he argues that acceptance is defined as an attitude and has no behavioural element. Van Meergen fails to acknowledge that neutrality can refer to apathy and that apathy can lead to resistance of an innovation, yet he recognises that focussing on ‘acceptance’ as a positive or neutral attitude overlooks the problem that the public may only ‘accept’ an innovation because they perceive they have no other choice or that their choice is limited. Hence ‘acceptance’ as a response can be ambiguous.

Acceptance is also an ambiguous term with regard to the interchangeable response it elicits depending on the situational context. For instance, it is common for individuals to accept an innovation for public use while rejecting it for private use, for example the use of alternative water sources such as greywater. Greywater is low polluted water which includes all the wastewater from a household except that from toilet flushing (Domenech and Sauri, 2010). In recent studies carried out in Israel, Friedler (2008) found that the public exhibited a high level of support for greywater re-use outside the home (irrigation of public parks, landscape area and flushing office toilets), with slightly less support for greywater use in the home such as private garden irrigation and toilet flushing. Furthermore, this characteristic of acceptance in one particular context but rejection in another, has been observed in relation to

innovation in water management for decades. Bruvold was one of the first pioneers of research into the public acceptance and/or rejection of water from alternative water sources and concluded that the public opposed using recycled water for close to body use, for example, drinking and bathing, and were more willing to use it for non-body contact such as irrigation (Bruvold and Ward, 1972; Bruvold, 1985). Yet, four decades later, numerous studies (Dolnicar and Schafer, 2009; Dolnicar and Hurlimann, 2010b) have consistently come to the same conclusion; recycled water is still more likely to be rejected if it is for food preparation or drinking. However, if it is to be used in circumstances with less human contact, for example fire-fighting and irrigation, it is more acceptable. One of the major drawbacks with this previous research is that many of the studies were based on stated intent methodologies. These studies may have yielded unbiased responses because there is often a difference between stated intent and actual behaviour. Nonetheless, a paradigm shift appears to have taken place and a number of studies have found that in certain circumstances, for example prolonged drought, acceptance of recycled water for consumption is evident (Bruvold, 1985; Dolnicar and Hurlimann, 2009). This illustrates that response to innovation can change over time but it is usually instigated by some form of incidence.

Likewise the acceptance of an innovation for public use, while rejecting it for private use, is also found in the example of alternative fuelled vehicles (AFV's). In response to increasing carbon emissions from transportation (Zhang, *et al,* 2011) governments around the world are encouraging the uptake of AFVs, yet acceptance of AFVs by private consumers has been slow (Yeh, 2007). In 2010 hybrid-electric vehicles accounted for less than three per cent of the US market share, more than 10 years after their introduction to the mass market (Zhang *et al*, 2011). In contrast, several studies have revealed that the use of hydrogen fuel cell vehicles for public transport such as buses and taxis has received a very positive response by the general public and drivers alike (Haraldsson *et al*, 2006, Achterberg et *al*, 2010). This polarized response may be due to the element of perceived risk associated with buying an AVF. An earlier study by Mourato *et al,* (2004) investigated the preferences of London taxi drivers for fuel celled vehicles, and while the majority were in favour of fuel cell fleets, those who were not cited associated risk as the reason why. This

included both financial risk, paying a higher price for an AVF and performance risk such as the risk associated with an unproven technology. For public vehicles the ownership of risk would be the responsibility of the transport authorities. In contrast private consumers would be the sole 'owner' of the risk, making their rejection of AFVs more likely.

The term 'compliance' has been used by some researchers in the literature to express a reluctant agreement to an innovation. This study will use the same description. The term 'social acceptance 'is commonly used in the literature and refers to public support for a phenomenon that mitigates environmental issues that cause social concerns and will be the definition used in this study. In their paper *"Social acceptance of renewable energy innovation: An introduction to the concept"* Wustengahen *et al* (2007) developed a model of social acceptance which includes three dimensions: socio-political, community and market acceptance. Socio-political refers to acceptance of technologies and policies by the public, key stakeholders and policy makers. Wustengahen *et al* (2007) argue that acceptance of innovation requires policies that enhance and encourage market and community acceptance such as financial incentives. This model is useful because it incorporates many of the barriers to adoption of innovations including stakeholder buy-in, policy and incentives; hence it lends itself to other environmental innovations because they share the same impediments of social acceptance.

Apathy, indifference and inertia

Apathy, indifference and inertia are terms that have been used in the literature to describe neutral responses to innovations. In essence, they all share very similar definitions, but apathy is the term more commonly used. Apathy is described as an 'indifference to change' or 'neutrality' and it is characterised by a lack of positive or negative emotions or attitudes (Cotesse, 1999, p. 210). Lapointe and Rivard (2005, p. 473) define apathy in reference to resistance to Information Technology (IT) innovations as 'inaction and lack of interest'. Indifference can reflect a lack of concern or motivation towards an innovation, often requiring a behavioural change. For instance, a study by Domenech and Sauri (2010) found that 10% of residents who had a greywater system installed in the apartment block were indifferent about

the feature. The term inertia has been used to refer to the fact that consumers choose to 'stay with what they know' (Hidrue *et al,* 2011, p. 699). For the purpose of this study the terms are defined and referred to separately (for now) because each of them is used in the literature. 'Apathy' is defined as 'lack of concern', 'indifference' is described as 'inaction' and 'inertia' is defined as 'lack of interest'.

According to Claudy *et al,* (2010) lack of interest can explain negative public response to innovation and can lead to apathy and indifference. They state that one of the factors contributing to the slow uptake of micro-generation technologies is public apathy, despite major marketing and public policy. Other authors agree and claim that apathy can also manifest itself as a response to innovations that are considered a social norm (Barr *et al,* 2003), for example recycling. They argue that there are many people for whom recycling is unimportant, while other participants regard recycling as an act of compliance and feel the need to conform under pressure, perhaps because recycling is seen as a social norm.

A common characteristic of response to innovation is that experiencing the intervention can result in negativity, causing a shift from acceptance to resistance or apathy. For example, prior to a greywater system being installed in homes in a Barcelona suburb, acceptance levels were high, yet on experiencing the greywater system, 20% of participants changed their mind (Domenech and Sauri, 2010). Likewise, this 'resistance-apathy nexus' was found in research by Sovacool, (2009). Following the energy crisis in 1970s the US government staunchly backed the renewable energy industry, striving to increase awareness and encouraging adoption of the innovative technologies. Despite government backing, the high expectation of a contribution from renewables failed to materialize because the technologies were not ready. The response to renewable technologies turned to apathy and, in some cases, resistance, causing a tarnishing of the renewable energy industry in the US for decades (Sovacool, 2009, p.4507).

Resistance - postponement, rejection and opposition

Resistance is an umbrella term used to describe a range of responses that rebuff innovation; it is commonly used in the literature, but there are few definitions.

Nonetheless, in the organisational development literature, in reference to change in the workplace, it has been described as the rejection of change (Cotesse, 1999). In psychology resistance is defined as 'the outcome of not being moved by pressures to change' and also as the 'motivation to oppose and counter pressures to change' (Kavanagh, 2004 p. 616).

Historically, a large part of research on innovation focused on adoption, with much less focusing on resistance to innovation (Kleijnen *et al*, 2009). For decades research into resistance to innovations was largely ignored (Ram and Sheth, 1989). In some instances resistance to an innovation was depicted as negative or simply wrong (Kavanagh, 2004), and advocates of the innovation assumed that people were mis-guided or that they did not understand the innovation. Fortunately, the importance of gaining insights into why innovation is resisted has been recognized and today there is considerable research on resistance to innovation (Kleinjin *et al,* 2009, Ram and Sheth, 1989, Ram, 1987). Understanding resistance is vital in terms of better matching innovations with consumers' requirements. Many authors have argued that resistance as a response to innovation is normal, allowing consumers the time needed to evaluate an innovation and safeguarding them from unsafe or unsuitable products (Coetsee, 1999; Ram, 1987; Ram and Sheth, 1989; Rogers 2003).

Ram and Sheth (1989, p.6) have defined innovation resistance as the 'resistance offered by consumers to an innovation, either because it poses a potential change from a satisfactory status quo or because it conflicts with their prior belief'. A serious weakness with this definition is that it is ineffective and elusive; it does not firmly state what resistance is, yet it is valuable because it identifies two antecedents of resistance to innovation (i) the degree of change required and (ii) conflicts with the customer's prior beliefs. These antecedents form the basis of two main barriers to adoption: psychological and functional.

Psychological barriers include the tradition barrier which often arises due to cultural changes that might be required of a customer in adopting an innovation (Kleijnen *et al,* 2009). For instance, a householder may decide to install a micro-generation technology in their home to produce their own energy, but in so doing they become

responsible for the upkeep and maintenance of equipment, and ultimately, the production of their energy requirement. Hence, there may be barriers to resolve before the householder considers adopting the technology. Functional barriers include 'usage' which refers to the compatibility of an innovation with the consumer's existing behaviours, practices, or habits. Those innovations that require a change in a customer's routine, for instance, separating household waste into glass, paper, plastics and food, tend to take a period of adjustment and habit forming before gaining customer acceptance.

The 'value' barrier refers to performance-to-price value compared with other similar or existing products such as the price of a conventional vehicle versus that of an AFV. The 'risk' barriers include physical, financial, performance and social risk (Ram and Sheth, 1989).

- Physical risk refers to the harm to a person or property that may be caused as a result of adopting an innovation. For example, those people who opposed consuming recycled water due to health concerns (Dolnicar and Hurlimann, 2009)
- Economic risk refers to the price of an innovation. The higher the cost of an innovation, the higher the perceived economic risk, such as those passengers who were happy to ride on a fuel celled bus but were not prepared to pay a higher fare (Haraldsson *et al,* 2006)
- Functional risk refers to uncertainty, and consumers are fearful that the innovation is unproven. For instance, some London taxi drivers chose not to participate in the fuel celled taxi experiment due to their concerns over the reliability of the technology employed (Mourato *et al*, 2004)
- Social risk occurs when customers resist an innovation because they feel that they will face social ostracism or peer ridicule if they adopt it. For example, some members of the public opted out of buying a Prius hybrid car for fear of what the neighbours and family members would think (Ozaki and Sevastyanova, 2011).

Previous studies suggest that resistance to innovation can be further delineated into three types (i) postponement (ii) rejection and (iii) opposition (Szmigin and Foxall,

1998, Ram and Sheth, 1989, Kleijnen *et al* 2009). Postponement occurs when a consumer decides to wait for a more suitable period to try or buy the innovation, despite finding the innovation acceptable in principle. This can be as a result of situational factors, for example the literature revealed that many individuals considered buying an AFV, but decided to postpone the purchase until the technology was proven and developed over time (Hidrue *et al,* 2011), or consumers who postpone the decision to retrofit their house with water efficient appliances until they can afford it.

Kleijnen *et al*, (2009) claim that rejection is not a function of lack of awareness or knowledge about the innovation on the consumer's behalf. On the contrary, they argue that it is a consumer's conscious evaluation of the product and, based on their assessment, they make the decision to reject it. A useful example of this is the widespread resistance to AFV despite decades of technological advances and promotion (Wiedmann *et al*, 2011; Yeh, 2007).

The final response form to be discussed here is opposition, where consumers strongly contest the innovation and deem it unacceptable not only to themselves, but to society as a whole (Kleijnen *et al*, 2009). For example, in 2006 the residents of Toowoomba, Australia opposed the introduction of a recycled water scheme by voting against a proposal for an indirect potable reuse plant despite a severe drought that had led to water restrictions since 2003 (Hurliman and Dolnicar, 2010b). Similar attempts to introduce the supplementation of surface water with reclaimed water in San Diego and Tampa, USA and Noosa, Australia met with public opposition, and plans were postponed or withdrawn (Marks, 2006). In Holland, such was the extent of opposition to a town council's introduction of a new blue bag system for refuse collection, that some members of the community sought ways to avoid it by bagging refuse and taking it to the neighbouring district – coining the new phrase 'refuse tourism' (Van Meegeren, 2001), thus actively demonstrating their opposition to the new scheme. In this study 'resistance' will be defined as refusing an innovation and the terms 'postponement', 'rejection' and opposition' will be described as per Kleijnen *et als*, (2009) definitions.

2.4 Drivers that influence responses to innovations

There are a variety of drivers that influence response to innovations in the water, energy and waste sectors. Attitudes, social influencers, knowledge, environmental awareness, practicalities, trust, socio-economic and demographic factors have been identified through the literature review because they reflect the most critical determinants in terms of influencing response in each of the three sectors, and measured in relation to studies examining them in the literature.

Tables (2-1, 2-2 and 2-3), below lists a selection of papers from the water, energy and waste sectors. They illustrate the drivers that influence response to innovation, and whether the study hypothesised the driver or whether it was exposed. The studies reviewed share many common features such as socio-economic and environmental awareness, however there are a few anomalies. For instance, in this review, fairness and justice and personal contact are specific to water, whilst financial risk was not a driver for waste recycling. However, this may be owing to the fact that fairness and justice have not yet been explored in the specific areas of energy and waste sectors chosen for this review. Likewise, financial risk has yet to be explored for waste recycling and waste minimisation.

Table 2-1 Drivers that influence responses by the public to innovation in water - alternative water sources and water conservation

Author	Type of Innovation	Response	Drivers that influence response by public to innovation in water -	Did study hypothesise the driver or was it exposed?
Alhunoud *et al,* 2003	Recycled water	Opposition	Financial (cost-willing to pay more to avoid water reuse)	Exposed
Bauman, 1983	Water Re-use	Social Acceptance	Socio-demographic, education, knowledge	Exposed
Dolinar & Schafer, 2008	Desalinated and recycled water	Acceptance	Confidence & Trust	Hypothesised
Dolnicar &Hurlimann, 2010b	Alternative water resources	Acceptance	Information source (influencers)	Exposed
Dolnicar *et al,* 2011	Recycled and desalinated water	Acceptance	Knowledge & understanding (benefits)	Exposed
Domnech & Saurí, 2010	Greywater	Acceptance	Environmental awareness, financial, Health risk, practicalities	Exposed
Feldman, 2011	Water conservation, alternative water sources	Adoption	Fairness & justice	Exposed
Friedler, 2008	Greywater	Acceptance	Financial and attitudes	Hypothesised
Gilg & Barr , 2006	Water conservation	Adoption/acceptance	Environmental attitudes	Exposed
Hills *et al,* 2002	Recycled water	Acceptance	Personal contact	Exposed
Hurlimann & Dolnicar, 2010	Recycled water	Opposition	Image	Exposed
Lam, S.P, 2006	Water- Conservation via dual flush toilets	Favour	Socio-economic	Hypothesised
Mankad & Tapsuwan, 2010	Decentralised water systems	Acceptance & Adoption	Socio-economic (age, income, ownership status, family size)	Exposed
Marks, 2006	Potable and non-potabe re-use	Acceptance	Communication, Trust, Risk	Exposed
Millock & Nuages , 2010	Water efficient equipment	Adoption	Environmental attitudes and household ownership status	Hypothesised
Russell & Hampton, 2006	Water recycling	Acceptance and opposition	Behaviour, sociological and cultural	Exposed

Table 2-2 Drivers that influence response by the public to innovation in renewable energy - alternative fuelled vehicles and micro-generation

Author	Type of Innovation	Response	Drivers that influence response to innovation in energy	Did study hypothesise the driver or was it exposed? H or E
Achterberg *et al,* 2010	Hydrogen technology	Social Acceptance	Environmental concern and trust	Cultural values and knowledge
Allen *et al,* 2008	Micro-generation (barriers and prospect in UK)	Postponement (implied)	Practicalities (space, facilities), financial incentives, knowledge and information	Hypothesised
Claudy *et al*, 2012	Micro-generation technologies	Adoption	Lack of knowledge & understanding	Exposed
Gould & Golob, 2008	Electric vehicles	Non-acceptance	Environmental awareness and information	Hypothesised
Haraldsson *et al*, 2005	Hydrogen fuel Vehicles	Acceptance /Social acceptance	Socio-economic and communication	Hypothesised
Mourato *et al,* 2004	Fuel cell vehicles	Acceptance	Financial, environmental awareness , attitude	Hypothesised
Ozaki & Sevastyanova, 2011	Hybrid Vehicles	Adoption	Environmental concern image financial, socio-demographics ,	Hypothesised
Roche *et al,* 2010	Hydrogen fuel cell vehicles	Positive response	Attitudes	Hypothesised
Sovacool, 2009	Renewable electricity	Favour and Rejection	Financial, attitudes , lack of information	Exposed
Yeh, 2007	Natural Gas Vehicles	Adoption	Incentives (financial/policy)	Hypothesised
Zhang *et al,* 2011	AFV	Acceptance	Socio-economic (income, children, gender)	Hypothesised

Table 2-3 Drivers that influence response by the public to innovation in waste - recycling and waste minimisation

Author	Type of Innovation	Response	Drivers that influence response by public to innovation in waste	Did study hypothesise the driver or was it exposed?
Barr *et al*, 2001	Waste minimisation, waste re-use and recycling	Acceptance	Attitudes and social norms	Hypothesised
Barr *et al,* 2003	Household Recycling	Acceptance	Attitudes and behaviours	Exposed
Convery *et al,* 2007	Policy (tax levy)	Acceptance	Positive attitude and behaviour	Exposed
Nixon & Saphores, 2009	Household recycling	Adoption	Knowledge & information, social influencers	Hypothesis
Omran & Read, 2008	Household recycling	Supportive/	Lack of information & knowledge, education, communications campaigns and practicalities	Exposed
Tonglet *et al,* 2004	Waste minimisation and household recycling	Supportive	Environmental concern Lack of knowledge & understanding (benefits), attitudes , practicalities/facilities,	Hypothesised
Van Meereren, 2001	Household Recycling	Social acceptance and opposition	Lack of open communication campaign	Exposed
Vicente & Reis, 2008	Household recycling	Positive reception/attitude/ indifference	Socio- economic, attitudes, information and incentives	Exposed
WRAP, Barriers to Recycling, 2008	Household Recycling	Resistance	Practicalities, knowledge and attitudes	Hypothesised

Attitudes

In their 2009 paper Hurlimann *et al* argue that positive community attitude is vital to the success of environmental innovation and that a major barrier to innovation is community acceptance. Similar results found in empirical studies on waste recycling, show that recycling behaviour is influenced by the attitudes of individuals towards recycling (Omran and Read, 2008, Nixon and Saphores, 2009). Moreover, results from a study carried out in Portugal found that attitudes towards recycling were more important than incentives (Vicente and Reis, 2008). A study in Australia (Gilbertson *et al,* 2011) found that situational factors such as drought can affect attitude and behaviours towards water conservation. This is similar to Bruvold's findings (1979) which indicated that that the attitudes of Californian residents towards water conservation were influenced by drought.

Social influencers

A more recent concept in the response to innovation debate is the role that social influence plays. Social influence is the extent to which members of a reference group influence one another's behaviour. Goldsmith & Goldsmith (2011, p119) claim that humans influence each other all the time, and 'people observe other's behaviour and imitate them'. Social influencers are those people (families, friends, peers), trusted organisations and information sources (media sources, leaflets, pamphlets, internet), that people seek to obtain more information about an innovation. For example, recent research from the USA claims that face-to-face communication via family and friends or work/school colleagues/friends is the most effective medium to get people to start waste recycling (Nixon *et al*, 2009).

Goldsmith & Goldsmith (2011) argue that response to innovation is not only influenced by attitudes but by a need to align ones behaviour to the social norm. A recent study by Barr *et al* (2003) substantiates their argument, showing that social norms play a part in people's willingness to participate in recycling. If people perceive that others around them are also participating, for example neighbours and friends, then it is seen as a normal behaviour. The intention to perform behaviour is based on personal factors (such as a positive or negative evaluation of performing

the behaviour) in addition to social influence that is the person's perception of social pressure on him/her to perform the behaviour. Therefore, 'social influence is a key element in shaping attitudes and behaviours' (Goldsmith & Goldsmith, 2011, p 120).

An investigation by Dolincar and Hurlimann (2010c) into the sources people use to inform them of water issues found that individuals and organisations in water management are most influential, followed by family members, scientists, and friends. These finding are in line with later research by Dolnicar *et al,* (2011) which examined drivers that affected public acceptance of recycled and desalinated water. The least influential and least trusted sources of information were government and politicians, which has significant implications for designing future information campaigns and setting new policies and regulations. There are many examples where social influence has been used to persuade people to adopt greener consumer behaviour. For example, following the oil crisis in the 1970s, President Carter had solar panels installed on the roof of the White House to increase awareness and influence the adoption of renewable energy (Sovalcool, 2009). This use of peer influence is also evident from verbal responses from a study into the adoption of hybrid vehicles by Ozaki and Sevastyanova (2011, p 2223). For example "my wife's boss had one, it worked and was more environmentally friendly" or "friends at the bridge club has one" and " my son has one " were reasons given as to why people bought hybrid cars.

Thus, social influence is a powerful means of influencing response to innovation and it can be used to advantage as was observed in the White House example above. More recently the use of social networks such as Facebook, Twitter, blogs and blog polls is becoming a popular strategy to target messages to younger generations who may miss more conventional media sources.

Knowledge and awareness of the innovation

The marketing literature claims that too much information can be a determinant of resistance to innovation (Ram and Sheth, 1989). Conversely, requesting additional information and knowledge was more common in the other literature reviewed (Dolnicar & Schafer, 2009; Achterberg *et al,* 2010).This call for more knowledge

includes knowledge of the existence of the innovation and knowledge regarding the benefits of the intervention, as well as a lack of information relating to “how to” use or gain access to the intervention.

Rogers (2003) claims that one of the reasons that innovations are rejected is that the public does not know that the innovation exists; this is highlighted by research on micro-generation technologies. A contributing factor to the slow uptake of micro-generation technologies was that householders were unaware of the variety of technologies available and while few people had heard of CHP (combined heat and power), the majority of respondents were aware of PV (photo voltaic) panels (Claudy *et al,* 2010).

Yet, even if the public is aware of an innovation, a lack of more practical knowledge and information can lead to negativity or inertia (Vicente and Reis, 2008). The recycling literature has long recognised the importance of knowledge as an influential factor for household recycling (de Young, 1989 cited in Nixon and Saphores, 2009). In a study in Malaysia, Orman and Read (2008) found that a lack of awareness and knowledge was a recurring reason given for not participating in recycling schemes, despite advertising campaigns which encouraged participation. This study also reported that even if an individual has pro-environmental attitudes and beliefs, a lack of information on how to recycle (materials accepted, collection points) may result in a negative response. Likewise, informing participants about the benefits of recycling and showing them that their actions made a real difference also contribute to a positive response to recycling (Vincente and Reis 2008).

Lack of knowledge regarding innovation is not unique to the waste sector. In Australia, despite the widespread public attention to alternative water sources due to severe drought conditions, many people claimed little knowledge or understanding of desalination or recycled water (Dolnicar and Schafer, 2009, Dolnicar *et al*, 2011). Research by Marks (2006) argues that multiple sources of information and various methods of communication and dialogue are required to fully inform the public.

In the energy sector too, a lack of knowledge about renewable energy, for instance hydrogen technologies, (Roche *et al,* 2010) was apparent, yet contrary to the

examples cited above such a lack of knowledge did not result in a negative response in one particular case. Research by Roche *et al* (2010) revealed that when participants were asked to consider hydrogen as an alternative fuel they were very accepting of it, despite admitting knowing very little about it. Achterberg *et al,* (2010) argues that support for a technology where an individual knows little about it, may be deeply rooted in cultural predispositions. They assert that people use their own general beliefs, knowledge and cultural predispositions, and that they rely on trust in the technology in making decisions.

Other studies have also found that more knowledge does not necessarily lead to greater support for a technology (Achterberg *et al,* 2010, Domenech and Sauri, 2010.) This phenomenon could be explained by research carried out by Kleijnen *et al*, (2009) who found that the ability of consumers to fully evaluate the future consequences of a particular innovation could cause rejection of the innovation. Conversely, in cases where an innovation could not be fully assessed, consumers were more willing to give the innovation the benefit of doubt.

Russell and Hampton (2005) claim that receiving more information, and hence increasing understanding of the innovation, can cause a person to change their view. However, they warn that the change of view may not correspond to that expected because people often select material that supports their views and interpret information in a way that reinforces those views. These findings on hydrogen acceptance and Russell and Hampton's theories on knowledge acquisition and processes (Kleijnen *et al*, 2009; Russell and Hampton, 2005) have important implications for communication and education strategies, as many advocates of innovation wrongly assume that simply educating the public will lead automatically to the acceptance of an innovation.

Environmental awareness and concern

Public awareness of the environment and the effect that human activities have on it has become increasingly prevalent in recent years (Allen *et al*, 2008), and concern for the environment can shape public responses to innovations. For some people environmental concern and their contribution to preserving the environment is vital.

These individuals tend to have a high level of environmental awareness and take action to reduce their ecological footprint (Heffner *et al,* 2007, cited in Ozaki and Sevastyanova, 2011). Studies into the adoption of AFVs found that some people based their decision to buy a hybrid car purely on environmental awareness rather than other attributes of the vehicle (Ozaki and Sevastyanova, 2011). For example, one respondent in a study by Ozaki and Sevastyanova, (2011, p. 2223) stated their reason for buying an AVF was "to assist in the fight against global warming by driving a greener car".

Concern for the environment is evident in the waste and water literature too. Tonglet *et al's,* (2004) research into waste minimisation and re-use found that behaviour is based around environmental values, active concern for issues, and perception that there is a serious waste problem. Numerous studies have found that those who participate in recycling activities cited concern for the environment as one of the reasons they participate, and that they were happy to be doing their bit for the environment (Omand and Read, 2008; WRAP, 2008). Claudy *et al,* (2010) claim that one of the factors that drives acceptance of micro-generation technologies is concern for the environment. Users of greywater systems appreciated that the system saved water and thus was environmentally beneficial (Domenech and Sauri, 2010). Likewise Corral–Verdugo *et al,* (2003) found a significant link between environmental beliefs and a specific behaviour in relation to water conservation.

Yet, Boardman (2004) argues that in spite of the public favouring environmental protection, they often show a reluctance to take responsibility for their own actions. Environmental psychology calls this the 'value gap'; that is the gap between environmental values and environmental action (Convery *et al,* 2006; Ojala, 2011). Boardman, (2004, p. 1931) asserts that people could do more to help improve the environment, but that this 'missing link in reasoning' meaning people feel they have done all they can. For example, they believe they recycle as much as they can or that one person does not make a difference. This is echoed in a recent report by WRAP who undertook research to obtain a deeper understanding of what prevents householders recycling as much as they could. The results found a number of barriers exist including 'attitude and perception such as not accepting there was an

environmental benefit or not getting a personal motivation reward from recycling' (WRAP, 2008, p.1). Hence, even when the environment is valued by a respondent it does not correlate that a related innovation will necessarily be adopted, suggesting that responses to innovation are not based on environmental concern and values alone (Gould and Golob, 1998), and indicating that there are multiple drivers influencing responses to innovation.

Practicalities

Many of the reasons cited for non-acceptance of an innovation are due to impracticalities; these include basic equipment like recycling containers and/or facilities in close proximity to the recycler's home (WRAP, 2008; Vicente and Reis, 2008; Barr *et al,* 2001), insufficient refuelling stations for natural gas vehicles and long charge time on batteries for electric vehicles (Yeh, 2007; Segal, 1995). It also includes practical information and advice and the knowledge of where to obtain this advice. For instance, a lack of practical information and knowledge has contributed to the slow uptake of micro-generation technologies (Allen, 2008). In order to install a thermal or a solar PV system, a south-east to south-west facing roof space is essential. Planning issues are also paramount and include grid-integration, planning permission and licensing. Other information that consumers require includes improved information on the financial incentives that are available, for example, renewable obligation certificates (ROCs) and feed-in tariffs. Without easy access to this kind of practical information people will be less willing to adopt micro-generation technologies because it will be too difficult. These examples of impracticalities highlight the importance of making adopting an innovation as easy and convenient for individuals as is permitted.

Trust

Trust, relates not only to an innovation itself but also in the trustworthiness of the source providing information about an innovation (Nixon and Saphores, 2008). Trust is vital because people often make decisions about innovations they have little knowledge of. In reference to hydrogen technology, Achtenberg *et al,* (2010) argue that people with a strong trust in the technology will be supportive, conversely those

who do not trust the technology will be less inclined to support it (2010, p. 6082). Yet, as indicated earlier, hydrogen technology is often accepted despite individuals knowing very little about it, thus in this instance it may be the technology providers that are trusted or mis-trusted rather than the technology.

Segal (1995) argues the same is true regarding the adoption of electric vehicles, lack of trust and an unfamiliar technology result in resistance. Fortunately, trust can be gained and Marks (2006) states that it can be developed through education, material support and regular contact, by allowing individual and social groups to be involved rather than 'have things happen to them' (p.138).

Financial risk

Studies on the preference and adoption of alternatively fuelled vehicles illustrate that price and incentives are salient factors in influencing response to innovation (Yeh, 2007). Incentives include market development policies, tax credits, accelerated depreciation and the creation of niche markets (Allen *et al*, 2007, p.6). The evidence show that financial incentives can have mixed results; for instance research shows that consumers will buy hybrid vehicles when miles per gallon performance is high enough to warrant the higher price. In a study of London taxi drivers driving fuel cell taxis, Mourato et al (2004) found that the majority of drivers interviewed were prepared to pay a premium for a fuel cell vehicle because of the long term cost benefit. However, other drivers were not willing to pay due to concerns about limited refuelling locations, unproven technology and price. One of the most important factors pertinent to the consumer's choice of natural gas vehicles (NGV) includes payback period; buyers were concerned that the price of natural gas is not enough to justify the higher cost of an NGV (Wiedmann *et al*, 2011). Hence the importance of price and incentives in helping create a market is evident, but if innovations are to be successful in the long term they must be developed in the market on their own merits.

Health risk

Negative response to innovations in water management due to health concerns is familiar, and includes concerns about close to body contact as well as unknown

concerns regarding pathogens, inorganic pollutants, organic micro-pollutants and hormones (Dishman *et al,* 1989; Alhumoud *et al,* 2003). The main findings of research by Dolnicar and Schafer (2009) concluded that 46% of those surveyed believed that recycled water was healthy compared to 69% who believed that desalinated water was healthy. The study also found that while respondents were concerned about the health issue of recycled water, few had factual knowledge about the true health risks associated with it (Dolnicar and Schafer, 2009). Marks *et al,* (2008) found that the health risk perception associated with recycled water was influenced by cultural norms that governed the ideas of water cleanliness; they argue that for recycled water to be accepted, the cultural meaning associated with different types of water and their use needs to be changed (cited in Mankad and Tapsuwan, 2011).

Socio-economic and demographic correlation with responses to innovation

Research on socio-economic and demographic variables has been extensive across each of the sectors. They are habitually studied to help predict public response to innovation by building a profile of the type of individual likely to accept or reject an innovation. Studying the socio-economic variations can help provide recommendations for planners, public officials, innovation developers, and marketers: Bruvold (1985) argues that by having an understanding of the audience's likely response to innovation based on socio-economic and demographic variables, communications campaigns, education programmes and knowledge required can be targeted for each group.

Yet, despite their popularity, findings from studies on socio-economic and demographic variables are often inconsistent and conflicting. Several studies have shown that water conservation activities are influenced by the socio-economic characteristics of the household such as education, income and house ownership (Millock and Nauges, 2010; Lam, 2006). However, these findings conflict with studies by (Gilg and Barr, 2006) who found age (older people), home ownership, smaller houses and political alliance (voted green/liberal democrats) were most important to the conservation of water. Research by Segal (1995) claimed that multiple vehicle

households, higher earners and commuters were more willing to buy EVs. Other studies contradict this; they found that multicar households and income (high) reduced the likelihood of buying an electric vehicle (Hidrue *et al* in 2011; Zhang et al 2011). Other research has revealed that being a homeowner is a positive influence in recycling participation, while those who rent are less likely to recycle. In addition, they found that the relationship between age and recycling was significant which corresponds with earlier research, (older adults are more likely to recycle) (Nixon and Saphores, 2008; Vicente and Reis 2008).

Thus, reliance on socio-demographic variables should be treated with caution as the debate on the value of such socio-economic and demographic indicators of response continues. Recently Russell & Hampton (2005) claimed that there are limits to the information that socio-economic and demographic variables can provide and they argue that a better undertaking for predicting response to innovation would involve examining other factors such as political views, cultural factors and local experience, of which the latter two may be based on deep, but usually unarticulated values, and therefore prove insightful.

Multiple-factors

Previous research has tended to consider each driver in isolation and has not studied mutual influences that influence response to innovation, and the effects of multiple factors has largely been ignored (Dolnicar *et al*, 2011). However, it is clear from the review that drivers of response do not work in isolation from each other. For example, several factors contribute to a negative response to AFVs, these include practicalities such as a lack of infrastructure, performance, safety concerns and financial risk, hence, it is often a combination of multiple drivers that influences response (Wiedmann *et al*, 2010). Similarly, there are multiple-drivers that affect public acceptance of alternative water sources such as perceived health risk, perceived cost, operation regime and environmental awareness (Domenech and Sauri, 2010; Dolnicar and Scahfer 2009; Friedler,2008).

This review also shows that there can be close links between the drivers that influence response to innovation, for example, there is a close link between trust and

knowledge. If individuals do not trust the source of the information and knowledge they received, they are unlikely to respond favourably. There is also a link between a lack of knowledge and perception of health risk in studies into attitudes to recycled water. Knowledge is also linked to the practicality driver, knowing how to carry out an action/behaviour or knowing where to obtain the relevant information is vital to adoption of an innovation.

2.5 Discussion and conclusion

The literature has revealed that researchers have identified and described an array of responses to innovation, ranging from apathy to adoption. Adoption, acceptance and to a lesser degree resistance to an innovation are the most commonly studied forms. In contrast, in the literature selected and reviewed for this study, responses such as 'postponement', 'rejection' and 'opposition' have been studied to some degree but there were no in depth or targeted research studies. Moreover, there is a large volume of published studies describing the drivers that influence response, yet multi-factors/drivers have not been addressed. The review demonstrates that drivers work in union to influence response to innovation, thus understanding the multi-drivers could prove invaluable.

Owing to the variety of methodologies used across the sectors there is a need to err on the side of caution. Many studies reviewed used stated preference methodologies (Dolnicar and Schafer, 2009; Hidrue *et al,* 2010; Achterberg *et al,* 2010) or hypothetical questioning. Thus, many responses are based on 'what if' scenarios and it is acknowledged that people are often intentional behaviour deficient. Hence, future research could include research into real-life response to innovation/interventions.

The manner in which the responses were expressed was typically via verbal answers to questions (where respondents stated what they would do or did) while other responses to innovation were communicated via an action or non-action (behaviour), for example participation in a recycling scheme or not participating in it. One of the most obvious differences between the manners of response was that 'opposition' was typically seen as an action/behaviour, most likely due to strength of

feeling against the innovation. Responses like ‘favour’, ‘approve’, and ‘positive reception’ were generally verbalised.

It is clear that the studies were using different terms to refer to the same response. There was no obvious pattern of sector specific responses, with the exceptions of ‘apathy/ indifference/ inertia’, a response more prevalent in the waste and recycling literature and ‘opposition’, a response more common in relation to recycled water. The review revealed that the nature of public response to innovation can change through time, but this switch usually occurs in situational circumstances such as prolonged drought.

The findings of this review are instrumental in recognising the variety of responses to innovation and the fact that one innovation can elicit a variety of responses from different individuals depending on context, situational and cultural factors. It also emphasises that an individual’s response can change, response to innovation is not always static and can have an element of fluidity about it. This realisation will be valuable in understanding public response to interventions in periods of drought.

The taxonomy of response presented in Figure 2-1 illustrates all of the responses to innovation revealed in the literature. The responses are categorised under three broad themes, positive response, neutral response and negative response. (This is not to imply that a simple for or against should be expected, as urban water management, waste management and energy management issues are complex and responses may be multi–faceted or ambiguous). Yet, there are caveats to these categories, the term ‘resistance’ is not considered wholly negative because resisting an innovation can be a useful means of communicating feedback about it or a means of protection against an unsafe or unwanted innovation. Likewise, as already mentioned, ‘acceptance’ of an innovation may occur due to a feeling of lack of choice. In level three of the taxonomy there were more positive response categories (5) compared to the negative response categories which had only one. This may be owing to the fact that many of studies reviewed examined positive responses to innovation such as adoption and acceptance. Moreover, it is also due to the fact that many of the positive responses such as ‘approve’, favour’ and ‘positive reception’ share very similar meanings, to the extent that is very difficult to determine hard and

fast distinctions between them. The most common responses (counts) include adoption, acceptance and resistance. The prevalence of these terms may be due to an accident of language used or as a result of previous research focussing predominantly on these responses. The remainder of the responses in the taxonomy were less prevalent which could infer preference for some terms for example preference for apathy rather than inertia or indifference.

In conclusion many of the innovations reviewed in this chapter are already successful in a technological sense, however, if they are to fulfil their role as an innovation (resolve the issue they were designed to solve), they need to be accepted and implemented by society. However, responses to innovations are complex, varying with individuals, culture, location and context. Closer examination of the variety of responses, the context in which they are expressed, and the manner in which they are communicated, may help towards a deeper understanding of public response to innovation. The taxonomy of response will be used as a framework for exploring and classifying responses to innovation in a drought context. The literature review has also revealed that, to date, no-one has looked at responses to innovation in the context of drought.

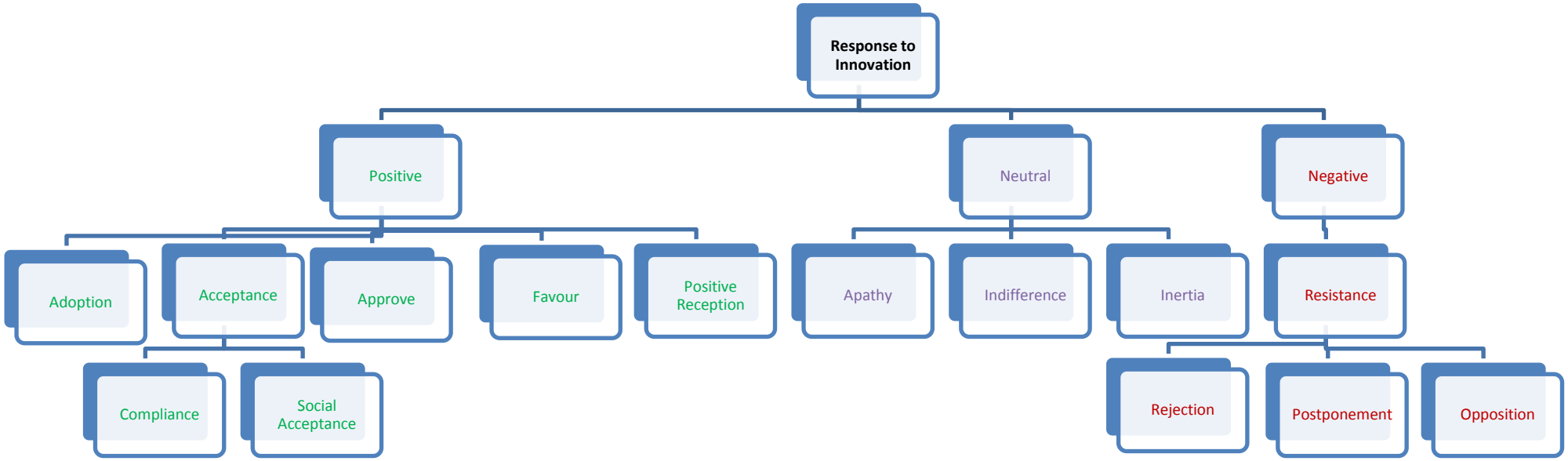

Figure 2-1 Taxonomy of public responses to innovation in the water, waste & energy Sectors

Source: Author

3 Methodology

This chapter outlines the methodological approach of the research project. It discusses the research design, the data collection process and the analysis process. The chapter concludes by providing a reflection on the research methods used in the study, research ethics, and discusses issues of research quality.

3.1 Methodological choice

The study employed a qualitative research method. Qualitative research aims at providing an in-depth and interpreted understanding of the social world of research participants by learning about their experiences and perspectives (Moriarty, 2011)**.** Samples tend to be small in scale and are selected purposively on the basis of salient criteria, hence, as a consequence, data is usually very detailed and information rich (Moriarty, 2011). Within this tradition, the study reported here provides a close examination of the language that people use, the way in which they argue, and the concepts they use to support their views about responses to the interventions employed to help alleviate the impact of drought.

Data collection options

A variety of methods were considered to obtain data to answer the research questions; these included focus groups, questionnaires/surveys, interviews and online media documents. A detailed description of the strengths and weakness of these options follows.

Focus groups

Originating in market research, the use of focus groups has spread rapidly (Moriarty, 2011).The focus group approach involves a small group of people, normally between six and ten, sitting facing each other (Hay, 2005). A topic is introduced and the ensuing discussion is moderated by the researcher. Typically the discussion takes place over one or two hours and is recorded by

tape or video. Ideally, written notes are also taken by a second researcher. Focus groups can be used as the primary data collection method or to complement other methods (Moriarty, 2011); they are particularly useful for preliminary data collection for the development of survey questionnaires (Robson, 2011). Additionally, they can be used to obtain participants' interpretations of results from earlier studies (Morgan, 1997).

One of the main advantages of using the focus group approach is that they are a relatively quick method of generating a substantial amount of data over short periods of time. Furthermore, the focus group approach allows for group interaction which can generate insights and data that might otherwise not be available. Moreover, Hay (2005) claims that the interactive aspect of focus groups provides an opportunity for people to explore different points of view, and to learn from one another.

However, the focus group method is not without its limitations. For instance, it does not lend itself well to allowing individual perspectives to come through; it can result in the under-reporting of views and opinions (Flowerdew and Martin, 2005). Likewise, it may be difficult to follow up the views of individuals (Robson, 2011) and one or two people may dominate the group (Morgan, 1997), which can lead to bias. Thus, an essential requirement to the success of the focus group method is a skilled and experienced facilitator. The role of the facilitator is to introduce the topics, moderate the discussion, to keep participants focussed on the topic of interest and to encourage the less articulate members of the group to share their views.

Questionnaires/surveys

Questionnaires/surveys are a frequently used method of data collection and are favourable 'when primary data is required about people, their behaviour, attitudes, opinions and awareness of specific issues' (Flowerdew and Martin, 2005, p. 78). They are principally used to collect standardised data from a large number of people, and therefore their results can be used to make

generalisations. There are three main means of administering questionnaires: (i) self-completion (post or email) (ii) telephone, or (iii) face-to-face.

Self-completion questionnaires are filled in by respondents, making them a relatively inexpensive option compared to interviewer-administered questionnaires. However, a major drawback of this method is getting the participants to return completed questionnaires without offering an incentive. Consequently, response rates tend to be low, typically 30-40% (Flowerdew and Martin, 2005). The design and layout of all questionnaires is critical to ensure the usefulness of the resulting data (Hay, 2005). Equally importantly, any instructions included with self-completion questionnaires must be clear and unambiguous, as interviewers will not be available to provide clarification to the participants if they require it (Kumar, 2005).

With telephone questionnaires the researcher contacts the respondents directly, asks the questions and records the responses. Hence, they tend to elicit higher response rates, yet are not much more expensive compared to post and email. They have an additional advantage in that the geographical distribution of the sample can be widespread (Robson, 2011). As with face-to-face interviews, the questions sequence can be controlled and filtered and clarification can be given as required (Flowerdew and Martin, 2005).

Lastly, face-to-face surveys require the interviewer to ask questions in the presence of the respondent and the interviewer completes the questionnaire (Robson, 2011). The advantages of face-to-face interviews are that the presence of the interviewer can encourage participation and the interviewer is available to clarify questions. However, the drawbacks of this method are that respondents may feel that their answers are not anonymous and the interviewer may unwittingly influence responses, resulting in bias (Robson, 2011).

Interviews

Interviews are defined by Maccoby and Maccoby (1954) as ‘face-to-face verbal interchange in which one person, the interviewer, attempts to elicit information

or expressions of opinion or belief from another person or persons' (cited in Hay, 2005). In other words it is a method that requires direct access to the person being interviewed. Interviews can be used as the primary method in a research project, but equally they lend themselves to a multi-method approach (Robson, 2011). They are an excellent means of gaining access to information about events, opinions and experiences (Dunn, 2005); they are also a sound approach to illustrate the diversity of meanings that different people can hold on a single topic.

There are three forms of interviews (i) structured (ii) semi-structured and (iii) unstructured. Structured interviews follow a pre-determined set of questions, in a pre-set order; they differ from face-to-face surveys in that they have a large number of open-ended questions (Robson, 2011). Semi-structured interviews still have an element of pre-defined questions and topics to cover but they are more flexible and can be tailored to suit the needs of the situation, context or as a result of an interviewee's answer to a previous question. Unstructured interviews are conducted within a general topic of interest, but they take a more conversational form; as a result the respondent has more control over the direction the interview takes (Robson, 2011).

Interviews have numerous advantages; they allow the development of rapport between the researcher and the respondent and they permit the researchers to observe participants' non-verbal communication, such as their use of gestures and facial expressions (Moriarty, 2011). Moreover, the respondent can provide feedback to the researcher, allowing the researcher to amend their line of inquiry or follow up interesting responses. Furthermore, tentative conclusions made by the researcher can be checked and verified during the interview. Finally, an interviewee may disclose issues that had not been previously identified by the researcher (Hay, 2005), allowing the researcher to modify any future interviews.

Like the aforementioned methods, interviews have drawbacks too. They are time-consuming to conduct, typically 30–60 minutes. Moreover, they require considerable preparation including contacting interviewees, setting up appointments and permissions, conducting the interview and writing up the notes and transcripts. A further disadvantage of this method is that interviewers may cause bias, usually by inadvertently influencing the respondent's answers. Nonetheless, this can be largely eliminated by adhering to rules of interviewing techniques (Fielding and Thomas, 2008), such as encouraging the respondent to talk freely and openly. The researcher should listen more than speak, ask questions in a straightforward non-threatening way and eliminate cues that could lead the respondent to answer in a particular way (Robson, 2011).

Online media documents

The rise of online journalism and interactive media provides a widespread forum for discussing news articles, (Diakopoulos & Naaman, 2011) and is changing the way that individuals and organisations share and seek information (Squiers *et al,* 2010*).* Previous studies by Nip (2006) have indicated that interactive journalism can facilitate (i) connecting with communities, (ii) engaging individuals as citizens and (iii) helping public deliberation in search of solutions. Manosevitch and Walker (2009) argue that one of the strengths of online and interactive journalism is that it may provide insights that the original newspaper article had not considered. It may offer a variety of perspectives on a single issue and it may extract personal experiences or individual concerns that could lead to tangible solutions (Gastil (2008) cited in Manosevitch and Walker, 2009), because such opportunities provide a forum for dialogue, feedback and debate. In particular, the comment sections of online news media provide a unique space for public discussions (Manosevitch and Walker, 2009). Thus, examining online discourse can offer insights into public perceptions that historically have been more difficult to obtain due to a lack of easily accessible public platforms.

To date most interactive media research has focussed on blogs; in contrast there have been few studies on the content of reader comments to online

newspapers and broadcast sites (Manosevitch and Walker, 2009), despite the fact that they offer a voluminous and diverse range of contributions from citizens. The comment sections of most online newspapers allow readers to offer their opinion and perspective on articles. The format may or may not require the reader to register with the news site and often does not require the reader to use their real name, (Hermida and Thurman, 2007) which can encourage more readers to contribute their opinion. However, one shortcoming of this anonymity is that it can lead to inappropriate and unsuitable language and a recent study by Manosevitch and Walker (2009) warns that comment pages can elicit uninformed opinion and inaccurate information.

Despite online media documents being classified as secondary data (Flowerdew and Martin, 2005), that is, publicly available data that has been collected by someone else for some other purpose, they are easily accessible, there are large volumes of data available and they are inexpensive to use. They also have the advantage of being less time consuming to collate compared with other data sources. However, secondary data does have weaknesses; it is inflexible, in that it cannot be customised to meet the researcher's own needs. Moreover, because the data itself is not replicable, it is unverifiable (Flowerdew and Martin, 2005), thus there is an element of having to trust the data.

Despite the stated benefits of focus groups, questionnaires and interviews and the added advantage that they each generate primary data, this is not reason enough to select these data collection approaches for this project. For example, focus groups and the aforementioned methods are more time consuming to both design and conduct, and there is a small cost associated with them compared to online documents. Moreover during the elapsed period it would take to set up the aforementioned methods, the public's memory of their immediate response to the hosepipe ban and the drought may become inaccurate and blurred, particularly as during late March/early April it began to rain heavily causing localised flooding in some areas which may have altered the public's perceptions of both the drought and the hosepipe ban.

Hence, it was decided that online media documents and their associated comment sections were most suitable for answering the research questions. They were chosen primarily because they could be used to help understand the public conversations that took place during the first few days and weeks following the media reports of the drought and the announcement of the hosepipe ban. In other words, owing to the fact that the online media articles and associated comments (data) were produced in the midst of the drought and hosepipe ban, the data collected represented the immediate responses of the public towards interventions to help alleviate drought. Online documents and, in particular, comment sections, are an up-to-date source of contemporary opinion. As a new platform for public participation, they are a significant and easily accessible forum for public discussion (77% of UK households had internet access in 2011 according to the Office of National Statistics). Furthermore, online media and comment sections are becoming a more widespread method of research in helping to understand how problems are communicated and conceptualised (Sonnett *et al,* 2006). Finally, the data is easily accessible and inexpensive and has the advantage of being less time consuming to collate. Data collection was conducted over a period of five weeks and a substantial volume of data was collated over this short period.

Table 3-1 (below) summarises the strengths and weaknesses of the research options. In conclusion, although online media is not without its limitations (secondary data, inflexible, quality issues), it is becoming a widely acceptable and useful data collection method (up-to-the-minute source of contemporary data, easily accessible, inexpensive with a large volume available) that can be used in a variety of research arenas.

Table 3-1 A summary of the research options strengths and weaknesses

Research Method	Strengths	Weaknesses
Online media documents	Data is easily accessible Large amounts of data available Inexpensive Up-to-the minute source of contemporary opinions	Secondary data Quality Inflexible
Focus Groups	Group dynamics help in focusing the most important topics Participants tend to enjoy the experience Relatively inexpensive and flexible Large amount of data can be collated	The number of questions covered is limited Requires a skilled moderator Conflicts may arise between participants Needs to be well managed or one or two people can dominate the group
Questionnaires	Relatively simple and straightforward approach to study of attitudes, values, beliefs and motives Responses are standardized, making for easier analysis Self –completion questionnaires can provide large amount of data at relatively low cost and in a short period of time Questions can be clarified by the researcher with face-to face surveys	Self-completion questionnaires are open to misinterpretation Self-completion questionnaires are not suitable for complex issues Self-completion questionnaires tend to have low response rates Face-to-face surveys may be affected by researcher bias
Interviews	Used to investigate complex behaviours and motivations High response rate Non-verbal clues can help understand verbal responses Semi-structure interviews are flexible and adaptable	Time consuming Occasionally it is difficult to obtain co-operation from potential respondents Potential for interviewer bias

3.2 Previous research using online media documents

Recent studies by Milioni *et al, (*2012) and Manosevitch and Walker (2009) claim that there have been relatively few studies examining the comments sections of online media. Yet, a shift has occurred and lately the use of content analysis to examine media documents and their associated comments has become more widespread. For example, in 2009 Manosevitch and Walker used content analysis to examine how the comment sections of newspapers provided a unique and constructive space for public discourse. They argue that the comment section is a valuable feature as it invites readers to comment on newspaper content, thus offering the opportunity to engage in a form of democratic discourse. Their study was conducted in the US and data was collected from two online regional newspapers. The findings revealed that the comments provided a significant amount of factual information and that the public demonstrated an ability to evaluate alternative solutions presented to them. They concluded that readers' comments sections are a legitimate space for public discussion and are worthy of future research both as a phenomenon in their own right and as a source of contemporary opinion.

Content analysis of newspaper articles, social media posts and tweets were also used by Squiers *et al* (2011), in addition to a web based survey to investigate public response to new mammography screening recommendations that had come into effect in 2009 in the US. The aim of the study was to understand the public conversations that occurred following the release of the recommendations and to investigate knowledge of and attitudes towards them. The study focussed on national newspapers, and search syntax was developed to identify relevant articles, posts, blogs and tweets. The final sample was coded to examine (i) whether factual information was presented about the new recommendations, (ii) to examine response towards the new recommendations (supportive, against, neutral or confused) and (iii) to examine the main reason cited for the response. The findings demonstrated that most of the newspaper articles and blogs expressed negative responses to the recommendations, whereas the sentiments of tweets were neutral (neither supportive nor against)

the recommendations. Additionally, most readers were unsupportive (>50%) and only a few were supportive (<18%) of the new recommendations. However, the study had a number of weaknesses. First, only national newspapers were included in the sample and only the content of tweets were coded. Nonetheless, the research resulted in public health professionals gaining a better understanding of how the public responded to the recommendations and was utilised to highlight the need for clear communication strategies for future campaigns.

Most recently Milioni *et al*, (2012) explored whether social media websites give the public greater power to influence news coverage. They used content analysis to examine readers' comments in a number of Greek online publications to determine if the readers had any sway in setting the agenda. The study also explored the degree of diversity of readers' comments. 177 articles and their associated comments on immigration were sampled from four online Greek newspapers and five news portals over a five month period. The content analysis of 3513 comments was undertaken by three coders, using a single comment as the unit of analysis. The findings suggest a low rate of readers raising new issues, implying that journalists still controlled the topic choice. On the other hand, many readers did challenge some of the journalists' points of view and openly expressed their disagreement. Finally, the findings revealed that a diversity of opinion in the comment sections was lacking with nearly 75% of readers taking the same position. Once again, the authors raised concerns over the study's limitations. Firstly, the use of a single comment as a unit of analysis may have led to some information getting 'lost'. For example, some readers discussed other issues before addressing the news article, yet comments that may have provided valuable information were rejected because they fell outside the research's definition. Secondly, there were concerns regarding focusing on a single issue, which in turn limited the potential of the research to form generalisations. The lessons learned from previous research using this method are listed below:

- Care should be taken when choosing the unit of analysis as relevant information can be ‘lost’
- There is no means of determining the demographics of the samples population
- Commenters interacted not only with the editorial but with one another
- Some readers were engaged in the discussion at more than one point in the lifecycle
- Narratives are important because they provide a diversity of perspective that is not possible in a single editorial

This study incorporated aspects from Squiers *et al* (2011) research method, specifically to examine if responses towards the interventions were supportive, opposed, or unclear.

3.3 Data collection process

Data collection was conducted using seven online media sources: BBC News online, Sky News, the Telegraph, the Times, the Daily Mail, the Express and the Guardian/Observer. The study included articles published between1st February 2012 and 30th April 2012. A broad mix of media sources comprising tabloids, broadsheets and television broadcasts were chosen for the diversity of coverage and to capture responses from a wide spectrum of the population. The very specific time period (stated above) was targeted in order to (a) reflect the huge amount of media attention regarding the drought as well as the forewarning regarding the hosepipe ban that came into force on the 5th April 2012 and (b) to make the search more practicable because even though the hosepipe ban was not lifted until July 2012, it began to rain heavily in late March/early April causing significant localised flooding. Hence, it was envisaged that many of the comments following this period would refer to the flooding events rather than be responses to drought alleviation interventions.

Selection criteria

Figure 3-1 (below) illustrates the data collection and selection process. A detailed description of how the data was collated is given below.

Phase one consisted of identifying relevant news stories and articles (the articles were not read at this stage and were selected on the basis of their headlines), using key words such as ‘drought’, ‘hosepipe ban’ and ‘water restrictions’. This preliminary search produced 122 articles. Despite the sizeable number identified, online data collection was not without its difficulties. For example, data was arduous to obtain from the Times online archive owing to technical issues regarding access to the online archive which the Times online team failed to resolve during the data collection period. This resulted in the collection of only eight articles from this source. Additionally, articles from the Guardian and the Observer were assembled together under the Guardian heading as a consequence of the manner in which archiving on their shared website was organized. Finally, the BBC News site proved most problematic to collate data from, due to the vast number of comments the articles attracted (443, 479, 900 and 938 for the four accessed articles). Difficulty was also experienced in terms of the time it took to download the comments. This was due to the configuration of the BBC online archive which the researcher believes caused word processing software to crash on numerous occasions, thus causing delays. Hence, only four articles from this source were downloaded. Nevertheless, the researcher is confident that the number of relevant comments (defined later) makes up for the relatively small number of articles.

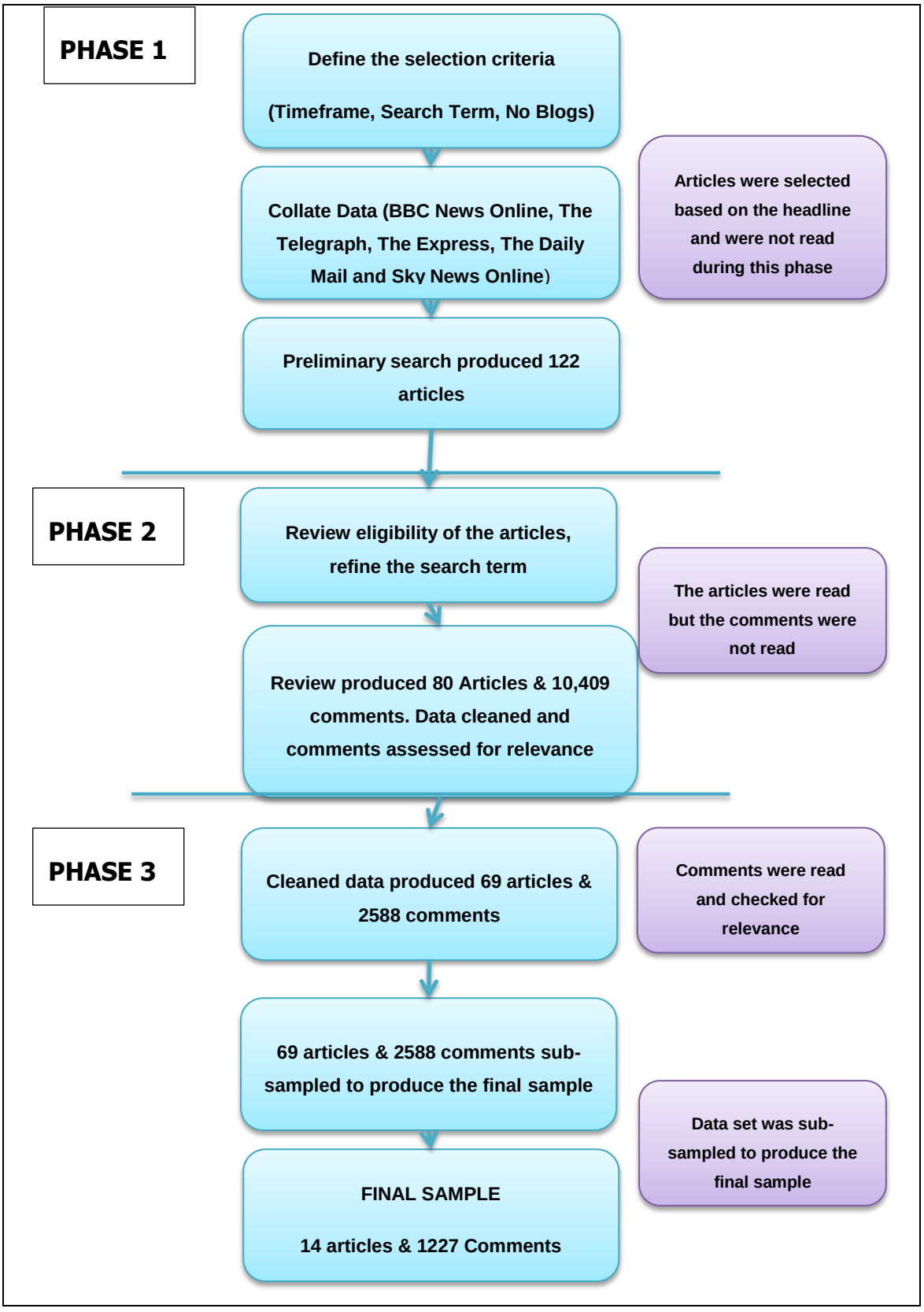

Figure 3-1 Data collection & selection flowchart

Phase two of the data collection and selection process involved reading and reviewing the preliminary articles (but not the comments at this stage) to determine their eligibility; articles that referred specifically to the drought in the article and included comments were retained, those that referred to the increased rainfall and localised flooding that was occurring during the period were eliminated, reducing the number of qualifying articles to 80 and the number of comments to 10,409. The articles and their associated comments were copied and pasted into word documents. The articles were cleaned to remove advertisements and links to other news articles/stories. The comments were assessed and relevant comments were kept; all other comments were discarded. Relevant comments are defined below and include:

- Responses to interventions such as acceptance, adoption or apathy.
- Interventions for example relocation, water transfers, desalination or greywater recycling.
- Drivers of response such as attitudes, financial risk or environmental concern.
- Comments that included a reference to leaking pipes, population increases, blaming the water companies and/or the government were included only if they were accompanied with (i) an intervention to help alleviate the impact of drought, (ii) a response to an intervention (iii) a driver of response.

The evaluation of comments (to determine their relevance) resulted in a reduction in the number of articles. For instance, two articles were removed because the majority of the comments were abusive and the content of the comments was outside the scope of the topic being examined. An additional two articles were removed because they contained no relevant comments once the data had been assessed. Finally, seven further articles were culled because the majority of the article fell outside the scope of the research; the culled articles focused on the impacts of drought on agriculture and wildlife, whilst

others reminisced over the 1976 drought. Hence, a total of 69 articles and 2,588 comments were considered relevant.

In phase 3 the sample population of 69 articles and 2588 relevant comments were sub-sampled to produce the final sample because qualitative research typically focuses in depth on relatively small samples selected purposefully (Patton, 2002) and for practicable reasons. A non-random sample procedure was devised to ensure that all media sources were represented in the final sample. The criteria for selection included: (i) ensuring that two articles from each of the seven media sources were included and (ii) that the articles were selected based on those that provided the two highest numbers of relevant comments from each media source. This ensured that the media sources were equally represented and a large number of comments, 1171, would be included and would most likely be representative of the views of the readers. This process reduced the number of articles to 14. Table 3-4 below lists the final articles selected for content analysis.

Table 3-2 Final articles selected for content analysis

Article Number	Media Source	Date	Identifier	Title of Article	Number of comments in article	Relevant comments
6	Sky	20/02/2012	S6	It's Official: South East In State Of Drought	193	66
7	Sky	05/04/2012	S7	'One In Three People Will Flout Hosepipe Ban'	193	90
12	The Telegraph	20/02/2012	TE2	Drought declared in the south east of England	405	70
24	The Telegraph	03/04/2012	TE9	Hosepipe ban: washing the patio could cost you £1000	231	36
36	The Daily Mail	12/03/2012	DM4	Diktats of the Drought Police. . . not just a hosepipe ban, but £1,000 fines for eleven offences on water use	964	245
41	The Daily Mail	02/04/2012	DM9	So why can't Britain make sure we all get enough water? Reservoirs are overflowing in the North as South suffers a drought	400	81
49	The Express	13/03/2012	EX1	£1,000 fine for using hosepipe	20	9
50	The Express	14/02/2012	EX2	Britain faces drought crisis: water shortage worst for 90 years	38	11
64	The Guardian/Observer	05/04/2012	GO11	How to reduce water consumption in your home	70	35
66	The Guardian/Observer	12/03/2012	GO13	Spring hosepipe ban announced for London and south-east	132	37
72	The Times	21/02/2012	TI2	Millions of families hit by worst drought in 30 years	21	12
73	The Times	27/04/2012	TI3	Rainwater harvesting will reap huge benefits	22	12
79	BBC	16/04/2012	BBC3	Hosepipe ban to be imposed in drought-hit parts of UK	938	298
80	BBC	20/02/2012	BBC1	Drought summit as rivers in England dry up	443	296
Total Comments					**4070**	**1298**

3.4 Data analysis process

Data analysis has been described as the laborious task of bringing data together in a meaningful way that enables the researcher to gain a deeper understanding of phenomena being studied (Wilkinson, 2000; Basit, 2003). Qualitative content analysis was used to analyse the data.

Qualitative content analysis

Content analysis is defined by Krippendorff (2004, p. 18) 'as a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use'. Silverman (2004, p. 182) describes it as a process *'producing a relatively systematic and comprehensive summary or overview of the data set as a whole, sometimes incorporating a quantitative element'.* Hence, as a methodology it can be both qualitative and quantitative (Harwood & Garry, 2003). It relies on the researcher's interpretation of the text and, for this reason, it is sometimes criticised as being unscientific and unreliable (Macnamara, 2005). However, if the selection criteria used in content analysis are sufficiently exhaustive to account for all the 'messages' encompassed within the data (Berg, 2008), the credibility (reliability and validity) of the method is enhanced.

Content analysis is a flexible method suitable for analyzing the content of a variety of data such as visual and verbal data. It is cost effective since data can be collated from a variety of publicly available documents and hence can be used in longitudinal studies (Berg, 2008). Nonetheless, content analysis is not without its constraints, for example it is limited by research questions that are too ambiguous, it is only as sophisticated as the categories defined by the researcher, it is vulnerable to over interpretation by the researcher, and it is ineffective for testing causal relationships between variants (Berg, 2008). Furthermore, it is time consuming; thus it is imperative that the researcher keeps the research questions in mind when conducting content analysis

because the sheer quantity of data that may not be related to the research questions can lead the researcher off topic (Elo and Kyngas, 2007).

Despite these limitations qualitative content anlysis is an appropriate choice to help answer the research questions because it explores the relationship between the text, the audience and the contextual meaning, helping understand the views and opinions of the readers. It can be used to examine either explicit communications or inferred communications (Hsieh and Shannon, 1995), and allows researcher to better understand the social world of the phenomenon being studied (Zhang and Wildemuth, 2009).

Content analysis process

The content analysis procedure used in this study was carried out manually using a mixture of coloured markers and the Excel software package. It was adapted from a method described by Elo and Kyngas in their 2007 paper 'The qualitative content analysis process'. Content analysis has a long history in nursing studies in addition to communication, journalism, sociology, psychology and business studies (Elo and Knygas, 2007). It is appropriate for this project because this study's method aligns with the method described in the paper. Figure 3-2 below illustrates the qualitative content analysis process.

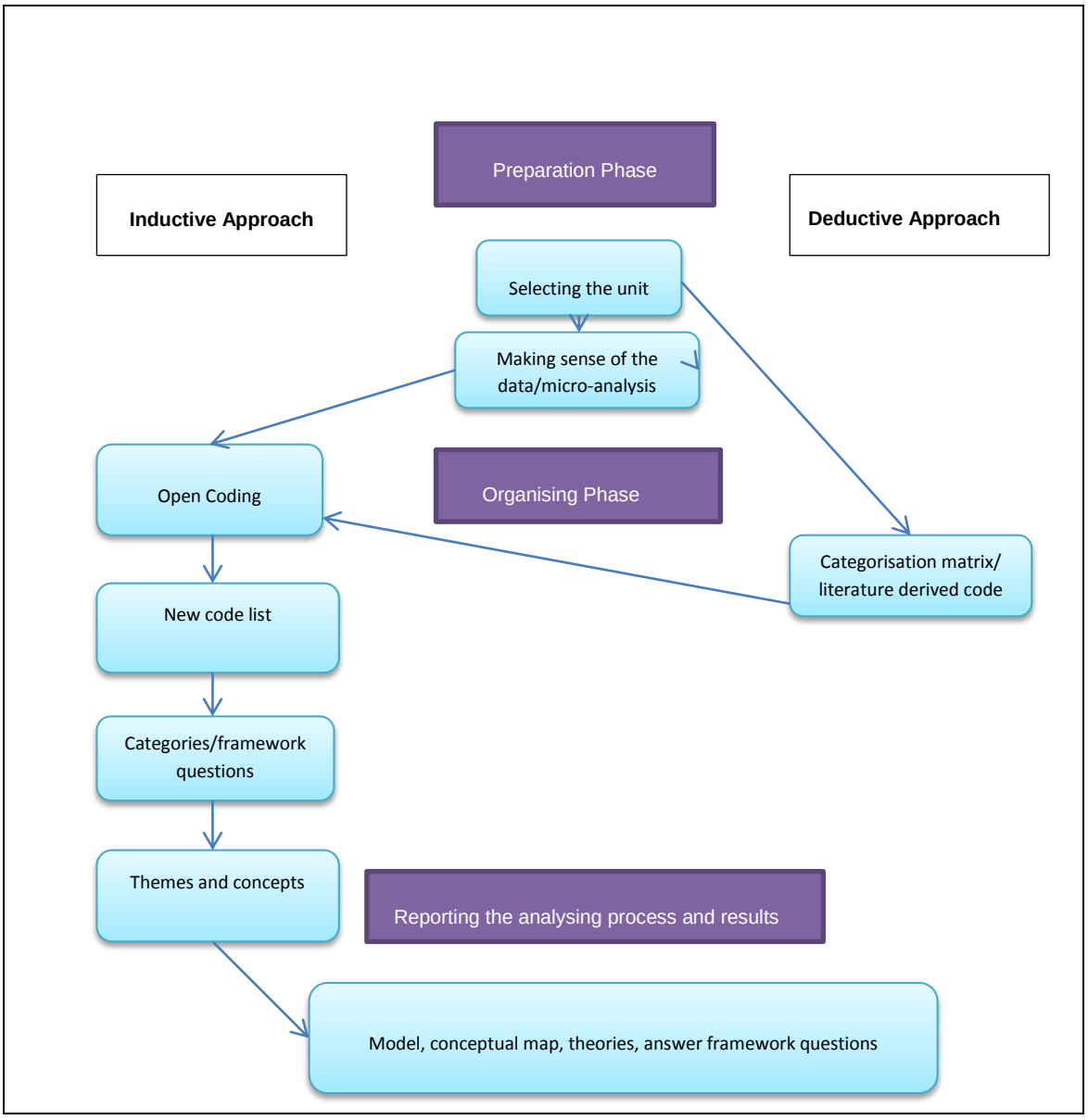

Figure 3-2 Preparation, organising and results phase in the content analysis process, Source: Adapted from Elo and Kyngas, 2007

Preparation phase

The aim of content analysis is to facilitate the reduction of phenomena or events into defined categories to enable analysis (Harwood and Garry, 2003; Elo and Kyngas, 2007). As a methodology, it may be used in an inductive or deductive way; an inductive analysis is carried out if little is known about the phenomena, whilst a deductive analysis is based on earlier theories or models (Elo and Kyngas, 2007). This study was a mixture of deductive and inductive analysis.

Content analysis begins with the selection of the unit of analysis, for example a word, phrase, sentence or paragraph (Krippendorff, 2004); the unit of analysis for this study was a word, phrase or a sentence. Both the manifest content (stated) and latent content (implied, thus requiring interpretation) of the data set was explored. The next phase involved getting a sense of the data via micro-analysis. Micro-analysis is a technique commonly associated with Strauss & Corbin's Grounded Theory. This study is not based on Grounded Theory, however the researcher decided to use this technique as an initial means of becoming familiar with the data. Micro-analysis involves detailed line-by-line analysis of a small quantity of the data set (three articles in this research project), to help the researcher focus on the content of the text and reflect on what it is really about (Strauss and Corbin, 1998). It involves an intensive examination of words and phrases and the procedure consists of asking questions of the data such as:

- What is going on?
- Who is involved?
- What is being said?
- How is it being said?
- Where is the event happening?

The aim of conducting the micro-analysis was to become completely familiar with the data, thus allowing the consideration of a range of meanings within the data and to avoid taking one view (Strauss and Corbin, 1998).

Organising phase

The organising phase consisted of a deductive and inductive analysis. The deductive analysis required the development of a categorisation matrix (Elo and Kyngas, 2007). In this study the categorisation matrix referred to the initial coding list derived from the literature review. The inductive analysis involved coding, creating categories/developing the framework questions and identifying themes and concepts. Table 3-4 below catalogues the literature driven code list which was used in open coding in the first cycle of coding. In addition, it

presents the new code list which includes both the literature driven code list and the new codes that emerged from the first cycle of coding. A number of the interventions in the new code list have been split into support, oppose and unclear categories. This is because outcome of the first cycle of coding found that some readers held supporting views about interventions, others were opposed to the same intervention, and some readers comments were unclear.

Table 3-3 Code Lists

Literature Driven Code List	New Codes List
Supportive response - Acceptance/adoption/approve/favour/positive reception/social acceptance/compliance	No change
Opposing response - Resistance/rejection/ postponement/opposition	No change
Neutral response - Apathy/indifference/inertia	No change
Drivers of response - Attitudes/knowledge & information/trust/practicalities/environmental awareness/ social influence/ financial risk/health risk	No change
Interventions - Use less water/ reduce how much water we use/ conserve water/ use water wisely	Supportive - use less water
	Opposed - use less water
	Unclear - use less water
Intervention - Education	Education and public communications campaign
Interventions - Alternative sources of water – greywater, black water, rainwater harvesting, re-use waste water	Supportive - alternative sources of water
	Opposed - alternative sources of water
	Unclear - alternative sources of water
Interventions Water restrictions/hosepipe bans	Supportive - water restrictions/hosepipe bans
	Opposed -water restriction/hosepipe bans
	Unclear - water restrictions/hosepipe ban
Interventions - Water saving tips/4 minute shower/ water proof timer/ changing habits, behavioural change/install water saving equipment/showers not baths	Supportive - water saving tips
	Unclear - water saving tips
Intervention - Water meters	Supportive - water meters
	Opposed - water meters
	Unclear - water meters
Intervention - Desalination	Supportive - desalination
	Opposed - desalination
	Unclear - desalination

Literature Driven Code List	New Codes List
Intervention - Water tariffs	Supportive - increased water tariffs/differential water tariffs
	Opposed - increased water tariffs/ differential water tariffs
Intervention - Reservoirs	Supportive - reservoirs/store water/conserve water during heavy rain
	Opposed - reservoirs
	Unclear - reservoirs
	Intervention - drip irrigation/water butts/watering can
	Intervention Supportive - water transfers /national grid/ water pipeline/canals/sell water
	Opposed - water transfers
	Unclear - water transfers
Intervention - Relocation	Supportive - relocation
	Opposed - relocation
	Unclear - relocation
	Intervention - Supportive - fix leaking pipes
	Opposed - fix leaking pipes
	Unclear - fix leaking pipes
	Intervention - Supportive - invest in infrastructure
	Unclear - invest in infrastructure
	Intervention SUDS
	Intervention Supportive - abstraction
	Opposed - abstraction
	Intervention ban extended to businesses

Coding

Coding and categorising play a fundamental role in qualitative analysis (Robson, 2011; Basit, 2003), because even though raw data can in itself be interesting, unless it is systematically and precisely examined it does not help the researcher understand the social world they are studying (Basit, 2003). Saldana (2008, p. 3) defines a code as 'a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data'. In other words, codes are tags or labels used for assigning units of meaning to the descriptive of inferential text (Miles and Huberman, 1994). However, it is prudent to remember that 'Coding is not a precise science; it's primarily an interpretative act' (Saldana, 2008, p. 4).

In this study coding took place in two cycles, the first cycle focussed on the unit of analysis, namely a word, phrase or sentence. The second cycle highlighted and focussed on the salient features of the data and generated categories/themes by grouping codes together. The repetitive activity of developing and modifying categories (by asking questions, comparing data and developing hierarchical categories) is part of the process of coding and is a vital component of understanding the data, and subsequently is core to the analysis and interpretation. Bernard (2006, p452) states that analysis is 'the search for patterns in data and for ideas that help explain why those patterns are there in the first place' (cited in Saldana, 2008). In this study the hierarchical categories consisted of four framework questions that were formulated to help focus the analysis and are listed below.

Framework Questions

The following four framework questions were asked of the data to help direct the analysis and to help answer the research questions**:**

1. What interventions have been suggested in the media articles and what interventions have been specifically suggested to help alleviate the impact of drought?

2. What kinds of responses to the proposed interventions are articulated in the comments?

3. Is there evidence of the taxonomy of responses developed in the literature review in the comments?

4. Is there any evidence of drivers of response in the recorded comments?

To summarise, the analysis activities were carried out in seven stages:

i. Data was collected and copied into Word documents
ii. Codes were developed from the literature review and identified from the data
iii. Codes were transformed into categories/themes
iv. The categories/themes that emerged from the data was used to formulate four framework questions
v. Materials were sorted by the framework questions, identifying similar phrases, patterns, relationships and commonalities or disparities.
vi. Sorted materials were examined to isolate meaningful patterns
vii. Identified patterns were considered in the light of previous research and theories and generalisations were established (Berg, 2008) and the framework questions were answered.

3.5 Reflection on research methods

This section presents a reflection on the research methods employed in the study and the challenges encountered in data collection and analysis. Firstly, the solitary qualitative research approach had limitations such as:

- Validity (defined as *'the degree to which what is observed and measured is the same as what was purported to be observed or measured'* (Robson, 2011, pp. 534), in essence this refers to how 'true' the research is. Qualitative research depends on the individual judgment of the researcher and is heavily dependent on the researcher's interpretation and analysis of the data, hence the 'truth' can be subjective.
- Reliability of the research is the ability to repeat the study with consistent results due to the researcher's personal knowledge and interpretation There is an inability to make generalisations to other populations because qualitative research is often specific.

If a mixed method approach (such as expansion of the research method to include focus groups and/or interviews) had been utilised which (Johnson *et al*,

2007, p 113) describe as ‘an approach to knowledge (theory and practice) that attempts to consider multiple viewpoints, perspectives, positions, and standpoints’ it may have provided a richer description of the social world, allowing a more complete and well-rounded view to emerge from the phenomenon being studied.

Secondly, the use of secondary data meant that the researcher was unable to control the way the data was collected and presented (Flowerdew and Martin, 2005). Furthermore, non-verbal information such as facial expressions, tones of voice and pauses which are often important clues in qualitative research are absent from the online documents and texts.

A third difficulty associated with this research approach was reducing the sample to a manageable size. The population sample that was originally selected was very large, with 80 articles and 10,409 comments, too numerous to analyse in the given timeframe. This could be avoided in future research by a better definition of the search terms used to identify relevant articles.

3.6 Research quality

Assessing the quality of qualitative research is important because it ensures the reliability and validity of the research. Silverman (2004) postulates that research quality is composed of the quality of methods, the quality of data, and the quality of data analysis. Quality of method entails ensuring that the method chosen fits the research topic and answers the research questions to the best advantage. Quality of data is achieved by providing sufficiently long sequences of texts in order that the reliability and validity of the data can be assessed. Reliability is defined by Robson (2011, p. 532) ‘as the extent to which ….a research project would produce the same results if used on different occasions with the same object of the study’, that is, the researcher must ensure that precautions are taken during data collection to prevent known pollutants, distortions and bias. (Krippendorff, 2004). However, replication in social studies is unrealistic because social environments are complex and dynamic and thus, by their nature, are difficult to control and reproduce. Therefore, reliability in this

context refers to reproduction of a study by another researcher using closely comparable protocol under comparable conditions (Petre and Rugg, 2010). As mentioned earlier, validity is defined as *'the degree to which what is observed and measured is the same as what was purported to be observed or measured'* (Robson, 2011, pp. 534). In other words, validity is concerned with producing high quality research that is true, trustworthy and plausible. It should address the important social issues and degrees to which available evidence and theories support the research results (Krippendorff, 2004). For example, quality of data analysis is demonstrated by showing how well the data is simplified to produce categories that reflect the data and through accuracy of observations, by the quality of reasoning and completeness of explanations (Petre and Rugg, 2010).

Finally, coder reliability can affect the research quality and is important in determining the validity of the research. The term coder reliability is used to describe how consistently two independent coders evaluate a data set and reach the same or very similar conclusions. It is a means of measuring consistency and is essential in content analysis because it makes coding more efficient. Without coder reliability a research project which includes data collection, analysis and interpretation is more likely to be dismissed as sceptical by reviewers (Lombard, 2010). In this study a sample of the data was coded by two independent coders to assess consistency and coder reliability. The coders were 77% in agreement.

Table 3-5 summarises criteria to assess threats to the research quality and the interventions adopted to mitigate risks.

Table 3-4 Ensuring research quality

Criteria	Criteria test	Techniques used to ensure the quality of the research
Quality of Method	The extent to which the study can be audited and replicated	• Demonstrate that the method chosen is applicable to answer the research questions. • Provide a detailed description of the methodology procedure so that it can be audited and replicated.
Quality of Data	Reliability and validity of data	• Document the procedure of data collection and describe how articles were selected. • Document and provide evidence that justifies treatment of text, inferences made and justifies the results.
Quality of Analysis	How well the data is simplified to produce categories that reflect the data	• Demonstrate how well the categories cover the data. • Ensure accuracy of observations. • Utilise quotations as evidence to support conclusions. • Ensure quality of reasoning and completeness of explanations. • Use appendices, tables and models to demonstrate the link between the results and the data. • Data set coded by two independent coders to assess consistency and coder reliability.

3.7 Research ethics

Ethics approval for the research project was not required because the data obtained was secondary data; they were online media articles that are publicly available.

3.8 Chapter summary

This chapter has provided a detailed description of the methodology employed in the data collection phase of this study. In summary, the study utilised a qualitative research design to explore public responses to the interventions used to alleviate the impacts of drought in England in Spring/Summer 2012. A qualitative content analysis approach was selected and data was collated from five online newspapers and two broadcasters' websites. The chapter aimed to provide a clear description of the decisions involved in selecting the procedures and methods and how the responses were investigated and analysed to achieve the aims of the research. It concluded with a discussion and reflections of the research methods, the issues of research quality, and research ethics. The next chapter presents the research findings.

4 Findings and Discussion

4.1 Introduction

This chapter will both present an analysis of the acquired data and, at the same time, will discuss the findings of the study. Each section comprises two parts; the first part reports the outcomes of the findings and provides a description of the data. This will be followed by a discussion and interpretation of the key findings of the study which compares the current findings to previous studies.

The analysis of the acquired data will be presented within the context of four framework questions that were used to help direct the analysis and to answer the research questions. As discussed in Chapter Three, a qualitative approach was used to describe and analyse the data. To supplement the qualitative content analysis, frequencies of the suggested interventions are also displayed visually.

The findings will be organised around the four framework questions discussed in Chapter Three. The thematic content of framework questions one and two is interrelated and is therefore reported together.

1. What interventions have been suggested in the media articles and what interventions have been specifically suggested to help alleviate the impact of drought?

2. What kinds of responses to the proposed interventions are articulated in the comments?

3. Is there evidence of the taxonomy of responses developed in the literature review in the comments?

4. Is there any evidence of drivers of response in the recorded comments?

The online discussions (via online articles, comments and threads) provided a wealth of data for the researcher regarding the media's and readers'[3] perceptions of interventions to help alleviate drought. The data revealed that a significant quantity and variety of interventions were proposed; the media mentioned 15 intervention types, whilst the public mentioned 21 interventions (see Figures 4-1 and 4-2 below).

Owing to the study's chosen methodology (secondary data from online media news articles and their associated comments), it cannot be stated that the public or media favored one intervention over another; however, what can be stated is the degree of discussion and debate within the media and articles and comment sections regarding specific interventions. The broad scope of the media articles was driven by the drought and the announcement of the hosepipe ban and reported on demand side interventions such as water conservation, in addition to fixing leaking pipes and expanding metering. In contrast, the public comments broadly focused on supply side interventions, for instance alternative water sources, technology and investment in infrastructure, and to a lesser extent on water conservation via water saving behaviour/tips, and the installation of water saving equipment. The most noteworthy interventions (based on relative emphases and counts in the media articles and the comment sections) emerging from the data were water conservation, water meters, fixing leaking pipes, relocation, water transfers, desalination, reservoirs and water re-use. The findings from each of these categories of intervention are described in the subsequent sub-sections, followed by a discussion and interpretation of the findings.

The objective of the following section is to compare those interventions mentioned and discussed in the media articles (by media journalists and authorities[4]) to those of the public. Quotes will be used as examples and

[3] Throughout the thesis the term 'reader(s)' will refer to members of the public who posted a comment(s)
[4] Authorities* comprise representatives from the water companies, the government, the Chartered Institute of Water and Environmental Management (CIWEM), the World Wildlife Fund (WWF), the Environment

illustrations. The quotes selected are not intended to be an exhaustive list. Quotes are referenced as follows: Media articles are defined with (MA) or (MJ) referring to a quote from an authority (A) or a journalist (J). They also have a capital letter and number which refers to the article source, for example B1 refers to BBC article number 1. Comments are defined with (C) and a capital letter and number which refers to the article from which the comment was sourced and a second number which refers to the comment number, for example DM473B refers to the comment section relating to the Daily Mail article 4 and comment number 73B

Agency (EA) & the Department for Environment, Food & Rural Affairs (DEFRA). The views of the authorities are reported via the journalists.

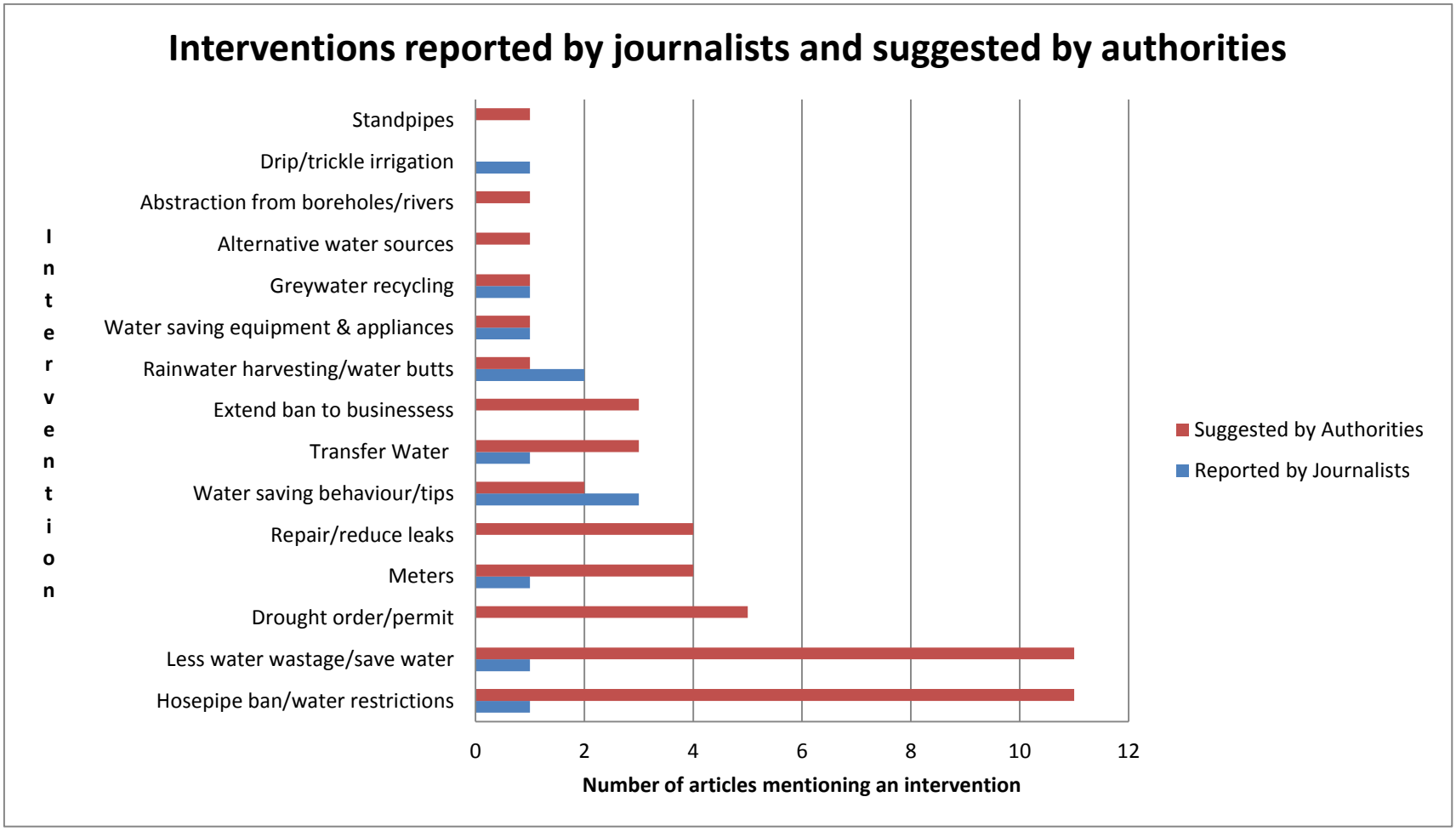

Figure 4-1 Interventions reported by journalists and suggested by authorities

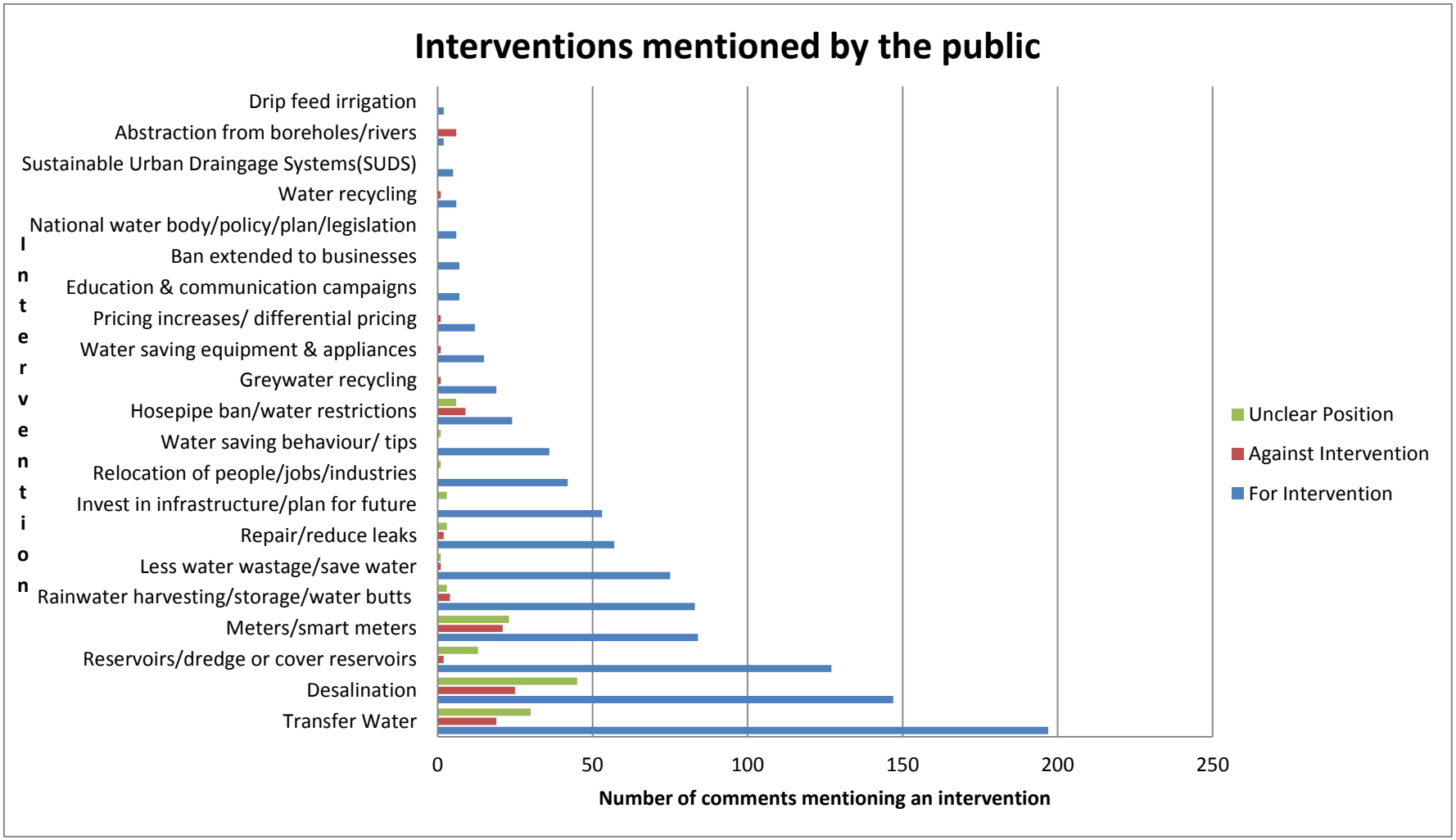

Figure 4-2 Interventions mentioned by the public

4.2 Demand side interventions

Hosepipe ban

Across the media articles there was widespread reporting of the hosepipe ban and water restrictions. Adhering to the hosepipe ban together with not wasting water were the most frequently cited interventions to help conserve water.

(MA)B3 *We can all help reduce the effects of drought by respecting these restrictions and being smarter about how we use water*

(MA)B1 *But the most important is to save water. Everybody knows how to save water*

However, the aforementioned interventions were often stated in a vague manner and only one article provided detailed tips and information on conserving water and water saving equipment.

(MJ)TI13 *Rainwater is collected from drainpipes, filtered and stored in tanks, ranging from the size of a garden shed to a small swimming pool, fixed to the side of the house or buried underground. A pump then supplies the water to washing machines, toilets or gardens, all in pipes kept separate from drinking water*

There were several readers who supported the hosepipe ban, acknowledging that rainfall had been below average and that the drought was a direct result of rainfall deficiencies.

(C)DM4-73B *yes, yes, yes but the most important factor is that it has not rained very much in a very long time…*

Nonetheless, the hosepipe ban was controversial; there were some readers who firmly believed that reports of water shortages were invented in order to increase water tariffs and consequently increase the profits of the water companies and shareholders, indicating a lack of trust amongst some readers towards the water companies.

(C)B1-172 *A Fabricated water shortage for the benefit of the corporation who controls it.*

(C)B1- 222 *Water shortage? Same old story from water companies when approaching the end of the financial year, in other words they want to hike their prices*

Many of the readers' comments highlighted the confusion around what the amended hosepipe restrictions included. Previous hosepipe bans had

prevented the use of a hosepipe to water gardens or wash cars. However, the new regulations listed 11 banned activities including hosing down paths or patio, cleaning walls and windows or filling a swimming pool, patio, fountain or pond. Despite many of the media articles discussing these additional banned activities in detail, confusion among readers was apparent.

B3-88 *A hose pipe ban doesn[']t ban you from using a hose pipe it just bans you from washing your car & watering your plants\garden with it. You could stand outside all day with a hose pipe & pressure washer and wash your path and it's perfectly legal!*

The use of the hosepipe ban as an appropriate means of conserving water was questioned. One reader (see quote below) claimed hosepipe bans were outdated solutions that were unsuitable for solving the problem of water shortages. They supported the conservation of water but rejected the use of the term hosepipe ban, favoring instead a water conservation communications campaign to help avoid confusion and ensure people understood that overall consumption of water should be reduced.

(C) B3-194 *How on earth will the antiquated 'hosepipe ban' solve anything? I can still water plants with a watering can from the tap. Using a hose is no different to having a shower in terms of consumption. Why don't the water companies stop issuing these draconian bans and tell people to bath less, shower more and do all the other things people can do to conserve water.*

Likewise, the provider of comment GO13-3 disliked the use of hosepipe bans. The use of the phrase 'futile gesture' implies that the reader regards the hosepipe ban as an inappropriate measure to mitigate water shortages.

(C)GO13-3 *Hosepipe bans are the most futile gesture towards reducing water use ever conceived. Less than 7% of average domestic water consumption goes on "outdoor" applications while 30% is flushed down the toilet. ….It's an insane system of disposal. The water companies know this but like hosepipe bans merely because they get people to think about saving water overall. Not that I care - I bloody hate gardening anyway.*

The person making this comment displays some knowledge of water use and expresses their concern regarding the use of drinking water for toilet flushing.

Interestingly, despite their apparent anger, they claim indifference to the ban, however, their outburst indicates they see a need for alternative measures to help conserve water.

Water saving behaviors and appliances/equipment

In contrast to the media contributors, discussion within the comment sections regarding water conservation behaviours and appliances were rarer. However, those readers who did mention water conservation behaviours displayed positive attitudes and understood that they were necessary due to water shortages. Many claimed that they conserved water in various ways such as having a dual flush toilet, rainwater harvesting and generally minimising the volume of water used in their homes.

(C)B1-142 *…I collect over 1000 litres of rainwater in barrels, which sees to gardening needs for most of the summer, as well as car washing. Shower, no bath. Dual flush toilet...*

One of the key messages in the media articles and, to a lesser extent in the comment sections, was that water conservation was everyone's responsibility

(MA)S6 *It is not just the responsibility of Government, water companies and businesses to act against drought. We are asking for the help of everyone by urging them to use less water and to start now*

(C)S7-46 *Funny how all those who advocate taking personal responsibility seem to have taken the day off.*

Water meters

A major focus of the readers' discussions concerned the installation of water meters, and many readers requested that water meters be made compulsory to help conserve water. Yet, many readers considered water meters as not just a way to save water but also a means of saving on water bills. This financial saving was seen as a huge incentive and many readers considered paying for the volume of water consumed to be fairer.

(C)S7-22 *I think they should fit water meters on every house so you pay for what you use, In my case my water bill is now a third of what it was..*

(C)DM9-58 *Why don't the water companies put EVERYONE on a met[er]? You'd be surprised at how much water and money you save when you are aware of it.*

Conversely, there were a number of readers who opposed water meters on the grounds that they believed they would lead to an increase in water prices. This belief implies a lack of trust among some readers regarding the water companies.

(C)B3-193 *If all houses had a meter they would simply charge more per gallon to increase profits, we would pay even more to line the pockets of the water industry*

(C)B3-222 *It amazes me that so many people are calling for water to be metered. As with gas, once we are all on meters, watch the price rise per unit at a rate that will make your head spin.*

The media articles also emphasized the use of water meters as a means of conserving water. At the same time however, a government minister implied that the installation of water meters was more suited to smaller households, inferring that larger households might be worse off financially.

(MA)B1 *Water meters can be helpful, particularly for households with a small number of occupants or a reduced income.*

Concurrently, a spokesperson from Anglia water suggested that water meters not only saved a precious resource, but could also be financially beneficial.

(MA)TI 2 *Meters reduce usage by 15 per cent, equivalent to an annual £100 cut in the water bill*

Despite the fact that there is a considerable volume of publically available information regarding water conservation measures and equipment, the contrasting views above highlight the need for better access to information and knowledge. This need for information and knowledge is echoed by the public. The authorities (via media articles) assume that water saving measures is common knowledge, yet the public often requested more information. For instance, the provider of the comment below refers to ‘people’ and ‘they’ which could infer that it is other people who need the knowledge and information, the

remainder of the comment suggests that he/she includes themselves in 'people'. They request information about water saving measures including knowledge of the existence of an intervention.

(C)DM4-225 *People need information. How can they save water? How can they re-use water? I.e. from the shower etc*

Fixing leaking pipes

The media reported on leaking pipes in terms of the volume of water wasted per day but were quick to emphasise the efforts made to reduce leakage by the water companies.

(MJ)S7 *The water firms bringing in restrictions say they are investing significant resources in fixing leaks,*

(MA)B1 *..water companies had managed to reduce leakage by 36% since the 1990s, but there was still a danger of a water shortage.*

In contrast, the public was outraged at the volume of water being lost via leaking pipes.

(C)S7-78 *Water Companies should be FORCED BY LAW to ……Fix ALL the Major LEAKS…*

These attitudes could explain why some members of the public opposed adhering to a hosepipe ban because they believed that the drought was a direct result of a lack of planning and investment, rather than a result of low rainfall.

Structural interventions - relocation

The most novel intervention proposed (by many readers), was the relocation of people, jobs and industry. It is unusual in that such structural interventions do not necessitate water conservation or increasing water supply. However, it would require acceptance by the public as well as a fundamental change in policy and the backing of government and industry. Nonetheless, as an option, it has potential. Recently, the BBC moved some of its programming away from London to Salford near Manchester. The transfer of this prominent institution

may give other industries the confidence to relocate to Northern regions of the UK, where water scarcity issues are uncommon.

(C)GO13-1 *How about moving the people and jobs to the water?*

(C)B1-42 *While it won't help this year, the government should move more departments to the North. With modern technology there is little reason to keep many civil servants in London or the South East*

(C)DM9-59 *The logical answer is not to move the water but the population.*

4.3 Supply side interventions

Water transfers

In contrast to the media contributors, the public was more inclined to advocate increasing the water supply, either by transferring it from where it is abundant to where it is scarce, or by obtaining water from alternative sources, such as desalination.

The most commonly cited intervention to increase water supply was the construction of a national grid. The term ‘national grid’ encompasses a variety of descriptions including ‘pipeline’, ‘canals’, and ‘aqueducts’. Many perceived that it is a suitable option because much of the infrastructure is already in place via the canal network.

(C)Ti2-4 *It should be a priority to build a pipeline to bring water from those parts of the UK that have it in abundance to those where it is scarce.*

Many readers were concerned about the lack of plans the authorities have regarding water transfers. They acknowledge that it would be costly but are confident that it would pay for itself in the future and that it is essential. There were frequent comparisons with the development and the cost of the high-speed train line and a large number of readers regarded the supply of water as more important and something that would benefit a larger proportion of the population.

(C)B1-235 *Climate change is happening what they [politicians] are doing to implement a system of moving water around the country just as they have in Tenerife. Yes it will cost, but it will pay dividends in years to come.*

(C)S6-62 *The water industry needs to copy the Yorkshire idea where water is transferred from one area to another via a single large pipe, this could be done on a north to south principle where water could be moved as and when required to areas in drought conditions.*

(C)Ti2-4 *It should be a priority to build a pipeline to bring water from those parts of the UK that have it in abundance to those where it is scarce. It would be a lot cheaper than the proposed London-B[i]rmingham high speed train, costing £32 billion or £320 million a mile.*

In contrast to the public comments, the media articles were less likely to seriously consider the development of a national grid. It was remarked upon in reference to Boris Johnson's call to build canals and aqueducts to carry water from wetter regions to dryer regions, but a national grid as an intervention was largely absent from the media articles.

Desalination

In countries that regularly experience water shortages, desalination of sea water is a common intervention, providing high quality drinking water for both households and industries. Recently, Thames Water in SE England built a desalination plant at a cost of £270 million to provide drinking water to homes and businesses in the region during drought events (Gray, 2012b).

Interestingly, despite the existence of only one large scale desalination plant in the UK, it was seen as an attractive solution to many readers and gained significant support. In fact, there were a number of readers who were exasperated by the lack of foresight and investment in desalination. The phrase 'we are surrounded by water' was commonly used by readers both to justify the development of desalination plants and to express exasperation that desalination is not seen as an obvious solution to water shortages.

(C)B1-216 *Here we go again. Have the powers that be not noticed we are surrounded by water as we are an island. Build desalination plants …*

Similarly, the provider of the comment below expressed their frustration via expletives such as 'for God's sake' and reinforced their reasons by referring to other countries that use desalination.

(C)S7-42 *we are an island for [G]ods[’] sake, [A]ustralia, [I]srael and similar countries have huge desalination plants which feed their reservoirs and national grids, the [I]sraeli's made the desert bloom …*

Another reader (C) TE2-69) also despairs and alludes to becoming indifferent towards the problem of a lack of water when the solution, as they see it, is obvious. However, what is apparent from this comment (and others), is that detailed knowledge about the desalination process and the equipment and technology required to run a plant is absence. Nonetheless, the reader acknowledges that desalination is not supported by everyone, and offers the solution of using desalination only during drought events. Interestingly, (because few readers refer to causal effects of drought), they make the link between drought and increases in food prices due to drought events.

(C)TE2-69 *I become a little bored with all the wringing of hands over the lack of water. Just in case you haven’t noticed we are surrounded by water. Desalination Units is what is required …..Some people appear averse to using these units, for whatever reason, but it would only be necessary to use them in dr[o]ught conditions to top up the reservoirs and help the Farmers keep the price of food down*

One observation of the data revealed that few supporters of desalination presented factual knowledge of what the desalination process involved, compared to those who were opposed to desalination. Conversely, many of those who opposed desalination proposed sound arguments against desalination and demonstrated factual knowledge and understanding of the process and the energy and environmental costs.

(C)B1-197 *I wondered how long it would take for the magic desalination 'solution' to get touted. Such plants produce small amounts of fresh water at immense cost (not least the amount of energy they use).*

(C)S6-7 *Desalination uses a lot of energy ! One reason it[‘]s used out East is the fact they literally have gas to burn ! WE here can[‘]t even produce enough energy for ordinary consumption let alone the huge amount that would be needed for desalination !*

(C)B3-26 *For those that advocate using desalination plants the cost per metric tonne of water produced is in the region of £20 energy costs. That will drastically increase water rates!*

Only one reader referred to the taste of desalinated water. The use of the term 'gross' in the quote below, suggests that the reader finds the taste repugnant. They reaffirm their repulsion by using a simile to describe the taste.

(C)DM4-211 *Has anyone actually tried Desalinated water? I have and it's gross! It tastes like there's a pine block in the water.*

One possible reason for the lack of comments referring to the taste may be because many readers will have only experienced desalinated water when abroad and may have put the taste down to factors other than the treatment process.

The evidence from the analysis conducted through this study infers that increasing supply is an attractive solution for many people. Indeed, some members of the public indicated that they may be prepared to pay a higher price for water as long as they don't have to change their lifestyle, behaviours and habits.

(C)B3-535 *I don't mind 5 quid on my bill if it means I don't spend half a day watering my allotment with a watering can from the nearest stream*

If this attitude was to become more widespread amongst the population at large it could pave the way to extending the water infrastructure in the UK.

Reservoirs

The media reported widely on the low levels of water in reservoirs due to two consecutive dry winters.

(MJ)DM9 *After two dry winters, reservoir levels are below normal across the country and in some cases extremely low. Swithland in Leicestershire is holding just 39.6 per cent of capacity, and Ogston in Derbyshire has plummeted to 53 per cent*

(MJ)EX2 *A record dry 18 months with virtually no rain over the winter has left rivers and reservoirs at critically low levels.*

In contrast many readers were furious with what they believed to be the mis-management of infrastructure, lack of planning and investment. In particular,

they were angry with the lack of maintenance regarding existing reservoirs, and selling off of many reservoirs following privatisation of the water industry.

(C)DM4- 36 *Now we can see the folly of selling off our water to private companies….The French own South East water and have no interest in building new rese[r}voirs etc. or imp[r]oving what we have ….They don't even mend leaks.*

Water reuse: **The missing intervention?**

Lastly, it is worth noting that the concept of water recycling was largely absent from both the media articles and the public discussions. There were only a couple of comments that recognised that water recycling was a viable intervention to augment the water supply and one that was already utilised in London.

(C)TE2-17 *I love London water, it makes a lovely cuppa. Recycling through many kidneys I understand is the reason. [C}an't we just go on recycling*?

(C)B1 -68 *Water is already being recycled. Each town along the river Thames takes water from the river, uses it, treats it and puts it back. By the time the water reaches the sea it has probably gone through a power station, two factories and three kidneys.*

The absence of water recycling as an intervention suggests that the population is either unaware of the concept or that there is a widespread belief that water reuse is extensively used.

In conclusion, Figure 4-3 below structures and illustrates the key findings of the suggested interventions. It was generated based on relative emphasis within the media articles and the comment sections. However, it is noted that the media articles were influenced by their requirement to report the drought event and the hosepipe ban, and that part of their remit was to convey information from relevant authorities to the general public. The interventions are deemed significant by the researcher (therefore subjective) based on a number of observations of the comments including the tone of discussion, the degree of emotion within comments, for example anger or frustration, and the extent of evidence of drivers that could influence response to some interventions such as a lack of trust.

The media articles emphasized conserving water and adhering to the hosepipe ban to help alleviate the impact of drought, and would require a behavioural change. In contrast, many of the public's discussions focussed on increasing water supply, which does not require a behavioural change and firmly passes the responsibility to the water companies.

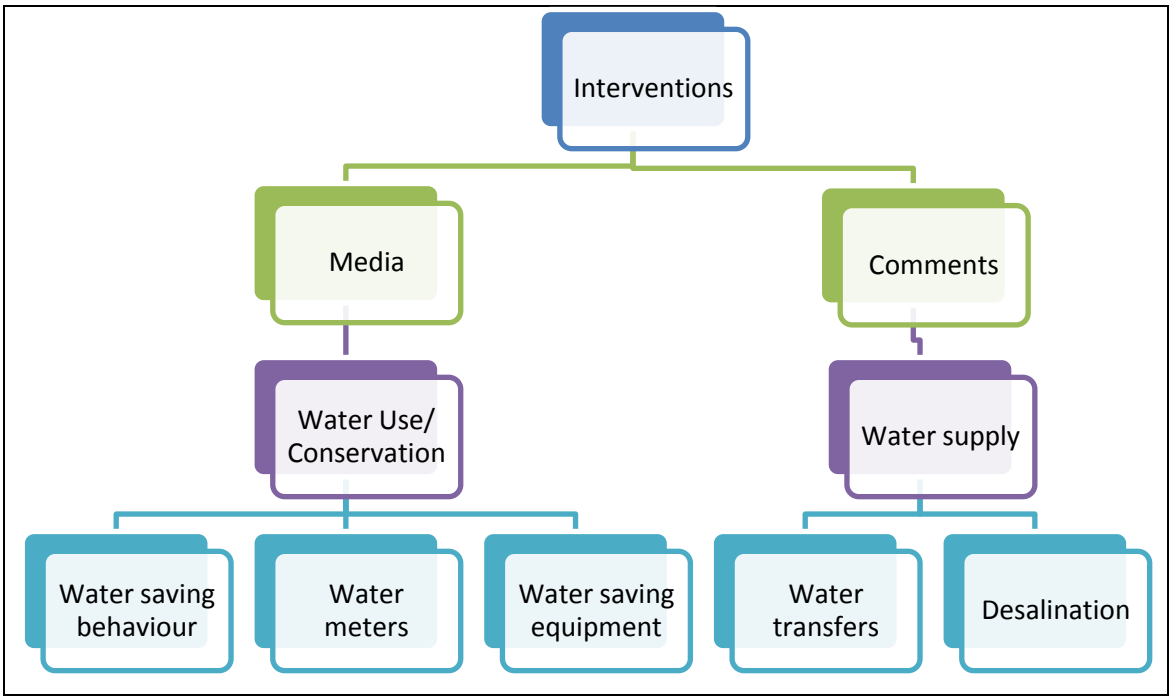

Figure 4-3 Interventions emphasised in on-line articles and associated comment sections

4.4 Discussion of demand side strategies versus supply side strategies

Adhering to the hosepipe ban and water conservation measures were firmly advocated in the media articles. Moreover, the media articles focused their attention on the current drought, while the readers discussed interventions to alleviate both the current situation as well as possible future drought events. However, as previously mentioned, this was likely because the media articles were reporting the drought event and the announcement of the hosepipe ban and were carrying out their role as an information source for the public. Bell

(2009) argues that the media can be a means of shaping how the public understands drought events.

Although it is true that the public emphasized the importance of increasing the water supply as the main intervention, it does not mean that they were unwilling to conserve water. In reality, many readers were aware of water shortages and actively contributed to reducing the volume they consumed by engaging in water saving behaviour and installing water saving equipment in homes and gardens.

As an intervention, relocation was an interesting concept, because it would not necessitate water conservation or increasing water supply. It is an intervention that has been deliberated in other countries too. For instance, researchers in Australia explored people's intention to relocate as an alternative intervention due to a prolonged ten year drought. A study by Hurliman and Dolnicar (2011) found that people stated they were most likely to relocate when there was insufficient water to meet their needs. Yet, in contrast to the Hurliman and Dolnicar study, relocation was an intervention suggested by the readers (many of whom indicated in their comments that they resided in the North of the country,) rather than from those in authority. It is likely that the reasons behind the suggestion of relocation were not entirely altruistic: many readers suggested not only moving people to areas with abundant water supplies, but also relocating jobs and industry, therefore helping improve the economic climate of the North.

Interestingly, and in contrast to previous studies, where water shortages were often used to persuade public opinion towards investment in large scale infrastructure (Reisner, 1993; Nevarez, 1998, cited in Haughton, 1998), the media encourages water conservation measures as a primary means of mitigating the current drought, whilst the public emphasises supply side strategies such as large scale construction projects like pipelines or desalination plants. One possible reason for favoring increasing the water supply is that these solutions would require no behavioral change, with some readers

indicating that they were unwilling to change their behavior despite the water shortages and restrictions. However, there may be another explanation, namely that the public was (subconsciously) planning for future drought events, because they no longer trusted the water companies to plan for future requirements. Many readers despaired that lessons had not been learned from past droughts; a large number referred to a lack of investment in water supply projects, despite the many intervening years they had to resolve the problems.

Consequently, these findings illustrate that there was no clear consensus regarding increasing the water supply or conserving water. In fact many readers advocated that both strategies should apply. Moreover, many readers did not have consistent opinions; some people expressed negative attitudes yet their stated behaviours proved otherwise. Another important point to consider is that an individual's response can change, depending on context or situation. For instance, in this study, many readers stated that they would adhere to the hosepipe ban if their water tariffs were reduced. As mentioned above, a study by Hurlimann and Dolnicar (2009) found that respondents stated that they would be prepared to relocate if there was insufficient water to meet their needs. Thus, responses to interventions are not always static, there can be an element of fluidity about them.

Surprisingly, despite the prevalent emphasis on desalination, this study found that comments regarding the taste of desalinated water were limited. This finding was unexpected because previous studies (Dolincar and Schafer, 2009) have shown that taste and attitudes to desalination are obstacles to the acceptance of desalinated water. One explanation may be owing to the fact that desalination is largely uncommon in the UK and many people may not have had direct contact with desalinated water. This lack of personal experience of desalinated water has implications if desalination were to become part of the solution to drought management.

The common factor in each of these interventions is that the responsibility of ensuring adequate water supply by increasing the volume would fall to the water companies, the government and agencies. While it is likely that the associated costs of such interventions would ultimately be borne by customers, the advantage would be that no behavioural change would be required.

To summarise, the findings from the media articles and public comments reveal that the mitigation and prevention of drought is a complex problem to solve; it is likely to require an integrated approach, allowing people choice when it comes to deciding which intervention best suits their needs.

4.5 Taxonomy of responses in the comment sections

The current study found that taxonomy of response developed from the literature (Figure 2-1) could be applied to illustrate the responses in the comment sections. The taxonomy is significant because it reveals the diversity of responses to drought mitigation interventions and that each intervention can evoke a variety of responses.

Supporting, opposing and 'unclear 'comments

Many of the interventions suggested in the media articles and comments sections evoked strong support or opposition from readers and some elicited both support and opposition. Support and opposition responses align closely with the level 2 positive and negative responses in the taxonomy of response (Figure 4-4). Specific examples of support (positive) and opposition (negative) have also been woven into the chapter, for example those on desalination.

Furthermore, a number (11%) of interventions elicited 'unclear' comments. Unclear comments were categorised into three groups (i) a description or explanation of an intervention (ii) a solution offered by comments which neither supported nor opposed the intervention or, (iii) a description by readers of their experience of a drought event or an intervention. Examples of each group are illustrated in succession below:

(C) GO13-16 *IF anyone is interested in the issues of transferring water from north to south, I suggest they look into the Spanish National Hydrological Project which is going on in Spain*

(C) DM4-235 *Just fill up a few buckets and a watering can to wash the car, no need for a hose and the car stays clean despite the little Hitlers*[5] *at the water board.*

(C) B1-142… *I collect over 1000 litres of rainwater in barrels, which sees to gardening needs for most of the summer, as well as car washing. Shower, no bath. Dual flush toilet.*

Moreover, many of the opposing comments were prompted by a supporting comment for an intervention. The aforementioned point and the unclear comments are significant as they highlight the fact that online interactive journalism can offer a forum for dialogue and debate between readers. It permits exchanging ideas, sharing knowledge, information and experience which can lead to a deeper understanding of the issues, and for the complexity of issues regarding drought and drought interventions to emerge.

The data was explored to determine how many responses from the taxonomy of response generated through the literature review could be detected in the data set. During the initial review of data it was apparent that 'positive' (support), 'negative' (negative) and 'neutral' responses to drought interventions were offered. Further analysis was carried out to search for evidence of the third level of the taxonomy; there was evidence of 'adoption', 'acceptance', 'approve', 'favour', 'positive reception', 'indifference', and 'resistance' Some terms in the taxonomy were easier to distinguish than others, for example 'compliance'. Many readers acknowledged the water shortages and stated their intention to comply with the hosepipe ban.

(C)B3-60 *Last autumn I planted six trees, the one instruction I received was to water them well in the Spring! A lot of journeys with a watering can looms!*

[5] The comment illustrates the infamous internet adage, Godwin's Law of Nazi Analogies, in which Godwin observed that, given enough time, in any online discussion regardless of the topic, someone will inevitably makes a comparison to Hitler and the Nazis (Godwin, 1990), thereby, according to Godwin, rendering their argument worthless.

The neutral responses ‘apathy’ and ‘inertia’ on the third level of the taxonomy were difficult to identify owing to their similar definitions. Figure 4-5 (below) illustrates the taxonomy of response populated with response comments. The response boxes shaded light grey were evident in the data set, whilst those shaded dark grey were absent.

The findings below will focus predominantly on the third level of response. A description of the response will be detailed, followed by discussion and interpretation.

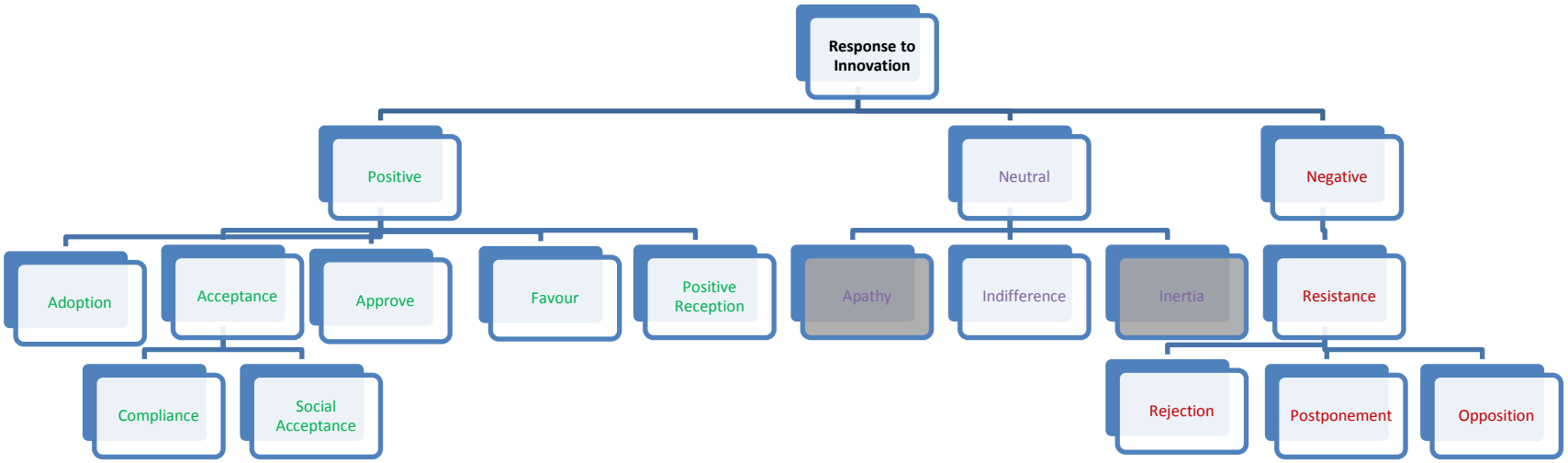

Figure 4-4 Taxonomy of response populated with responses found in the comment section

Adoption

Data analysis revealed that readers demonstrated a high willingness and positive attitude to adopting interventions designed to save water, such as water meters, water saving equipment and installing rainwater harvesting systems/water butts. As stated earlier in Chapter Two, adoption of an intervention refers to making full use of the intervention, including its implementation. Many readers discussed the simple water saving behaviours they had adopted and water saving equipment they had installed in their homes and, in particular, their gardens.

(C)GO11-9 *We have a pump for siphoning off bath water, that we got from Lakeland a few years ago. It works really well. The hose goes out of the bathroom window and attaches to a hose. We use the grey water for shrubs and ornamental plants.*

(C)B1-245 *When I installed a water meter …my bill fell dramatically ….Your bill will only go up if you're wasteful. Some basic tips: 1. If you've got a garden, get some water butts and collect your rainwater. 2. Don't try to keep your lawn a deep emerald green colour. 3. Don't try to keep your car beautifully shiny.*

(C)GO11-18 *In the past when our well was very low, we used rainwater in the washing machine and for flushing toilets with no problems.*

In addition, there were a few readers who referred to adhering to the hosepipe ban; indeed one reader firmly believed that it should have already been implemented, and called for an immediate ban, while others ascertained that the ban should be more restrictive, both in terms of the extensiveness of the ban and the timescales.

(C)DM9-79 *There should have been a total hosepipe ban at least 2 years ago. Stop procrastinating and impose the ban now.*

(C)B3 -68 *..The ban should be national and permanent.*

As mentioned above readers discussed the many water saving behaviours and appliances and equipment they had adopted. In particular, the adoption of rainwater harvesting for irrigation of gardens was frequently cited as a means of saving drinking water. This implies that gardeners may be more aware of and/or inclined to implement measures to conserve water compared to non-gardeners. In fact many readers were concerned with the use of drinking water for tasks such as irrigation, toilet flushing and washing cars. This infers that some of them regarded the use of

drinking water as wasteful for uses other than consumption and close to body contact.

Acceptance

Overall, compared to adopting an intervention, there was more evidence of 'acceptance' of an intervention. Nevertheless, the term 'acceptance' can insinuate that people feel they have no other choice. 'Acceptance' can be viewed as tolerating an intervention. This was echoed by some readers who stated that they accepted the need for the hosepipe ban, yet their comments provided a multitude of options to help mitigate the drought, inferring that although they accepted the current situation they believed that more could have been done to prevent it.

(C)S7-57 *Yes, I realise there is a drought and understand why this is happening and it needs to happen ..... however: Firstly everyone should be on a water meter. That way you only pay for what you use. Second, the water companies need to fix any leaks[..]*

(C)DM4-73b *yes, yes, yes but the most important factor is that it has not rained very much in a very long time. I agree that the overdevelopment of the South East has been irresponsible, but so have individual people in their limitless use of water.*

(C)DM4-272 *Yes, yes I'll fall in line and do all this.....but here's an idea...how about Thames Water fix all the HUGE leaks that they know about!!!*

In this study discussions regarding recycled water are largely absent. One explanation may be because in previous studies interventions were presented to participants (Dolnicar and Schäfer, 2009; Dolnicar *et al* 2011) whilst in this study interventions were mentioned by readers. Furthermore, earlier studies found that attitudes can change depending on situation context, for example during periods of prolonged drought acceptance of recycled water for consumption is evident (Bruvold, 1985; Dolnicar and Hurlimann, 2009), yet the limited discussions around recycled water in this study implies either that it is already an accepted intervention or readers were unaware of recycled water.

Approve, favour and positive reception

One of the more difficult categories to populate was the 'approve', 'favour' and 'positive reception' owing to the fact that they have very similar meanings (positive support for an innovation). The quotes below are examples each. However the

similarities in terminology infers that the literature studies different terms may have been used to describe the same phenomenon.

(C)S7-66	*water is more important and yet the least expensive. UK needs rain water to maintain good water supply, so I support the hose pipe ban.*
(C) B3-266	*It is a very serious issue and one that we should all take more note of. Most of us have water meters and many have a water butt. I am happy with a hose pipe ban – I would rather that than a drought.*
(C)DM4-171	*A hosepipe ban. Hardly the end of civilisation as we know it is it? Seems like a reasonable enough short term precaution to me.*

Resistance, rejection, postponement and opposition

The analysis revealed that negative responses were numerous. For example, many readers expressed their anger at the water companies and the government for their failure to plan for the future, invest in infrastructure or fix leaking pipes, and they communicated their frustration by firmly resisting interventions such as the hosepipe ban.

(C)B3-129	*It's not privatisation that is to blame, but the miserable lack of oversight from governments and regulators. There is no excuse for not providing water ….but someone has to have the competence to collect, manage and, if necessary, move it around. A ban is totally unacceptable.*

Furthermore, some readers steadfastly claimed that as they paid for water, they were entitled to use as much as they wanted. Indeed, some readers stated their intent to use more than they needed. Some readers claimed that until they got a rebate on their bills there would not adhere to the hosepipe ban, which infers resistance by postponement. The comment below infers that the reader felt strongly that as they had paid their water bills, the onus was on the water companies to provide that service. Moreover, it implies that they perceived that they had no role to play in conserving water nor did they acknowledge that their actions may have contributed to water shortages. In essence this implies that these readers considered water to be a commodity rather than a natural resource. The privatisation of the water companies and paying water bills directly to them may have brought about this change in attitudes.

(C)B3-215 *I am paying for it. If the car needs a wash or the grass wants a little drink I will still use it.*

(C)DM4-264 *I'll use as much water as I like because I am paying for it...I'll leave it running just to get my money worth.*

Other examples included those readers who rejected an intervention if they were required to change their behaviour. Some readers justified their reluctance to change behaviour due to practicalities.

(C)DM4-260 *I won't give up my half hour shower for the all the tea in china.*

(C)GO11-27 *.. Keep tap running, wash things under constant stream of water, frequently add washing up liquid to the sponge as it gets washed off, Yes, it's wasteful but has the advantage of rinsing at the same time. I can't stand washing dishes without rinsing and I only have a single sink and no space for a bowl of soapy water plus a bowl of clear water.*

Many readers opposed the widespread installation of water meters, fearing that it was an excuse to raise water tariffs.

(C) B3-222 *It amazes me that so many people are calling for water to be metered. As with gas, once we are all on meters, watch the price rise per unit at a rate that will make your head spin.*

In the literature review resistance to an intervention was related to the degree of change required and how the proposed intervention conflicted with the customer's prior beliefs (Ram & Sheth, 1989). The current study found evidence of this with some readers unwilling to change their behaviours, for example reducing the time spent in the shower. The strong opposition by some readers to mandatory installation of water meters is similar to findings by (Kleijnen *et al*, 2009) who found that consumers can strongly contest the innovation and deem it unacceptable not only to themselves, but to society as a whole. Yet, anger and frustration towards the water companies was also a factor that influenced readers' resistance to drought interventions; this is echoed in research carried out by Bell (2009) and Haughton (2011).

Indifference

The most challenging response category to populate was that of neutral responses. Apathy, indifference and inertia all have very similar meanings and are defined as 'lack of concern', 'inaction' and 'lack of interest', particularly if a behavioural change is required. Indeed, only one comment indicated a neutral response.

DM4-210 *Makes no difference to me. I'm on a water meter (not by choice) and cannot afford to use a hose pipe!*

It is not surprising that there were so few comments which unambiguously exhibited neutrality because it can be assumed that those readers who are indifferent to the drought would be less likely to be attracted to an article on water shortages, and thus unlikely to either read an article on drought or post a comment. Nonetheless, if a large proportion of the public is indifferent to the drought (and it is difficult to assess how many could be for the reasons mentioned above), this could be a concern for water companies and authorities alike. Water is a resource that everyone utilises, so it is imperative when planning for future communications campaigns and/or investments that this proportion of the population is included, despite being difficult to engage.

To summarise, there is evidence in the data that many of the taxonomic elements are useful indicators of response to interventions in this study. However, the analysis reveals that evidence is easier to distinguish in some areas than others, for example, 'apathy', 'indifference' and 'inertia' were difficult to differentiate as were 'approve', favour' and 'positive reception'. This may be owing to the fact that theories from the academic world can be difficult to demonstrate in the real world. However, it may also be as a result of the fact that researchers from different disciplines used similar terms to explain the same phenomenon. Hence, the terminology from the literature review and that of the comments section were reviewed and resulted in the combination of the terms 'approve', 'favour' and 'positive reception' as well as 'apathy', indifference' and 'inertia', to generate a re-configured taxonomy of response Figure 4-5 below more accurately illustrates the taxonomy of response from this study. Moreover, further studies may find that the re-configured taxonomy of

response may in fact more accurately reflect public responses to interventions in general.

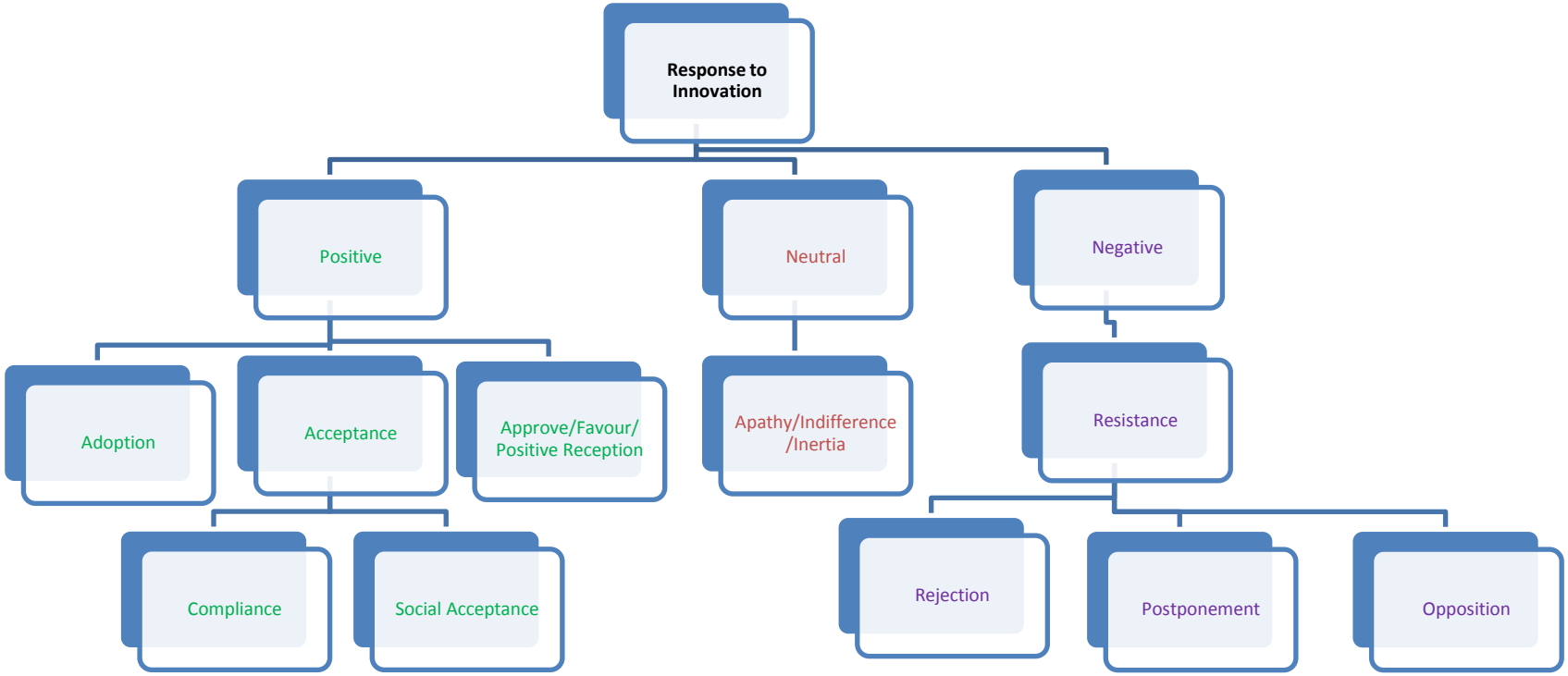

Figure 4-5 Re-configuration of the taxonomy of response based on responses found in the comments sections

4.6 Drivers of response detected in the comment sections

A number of drivers were identified as playing a key role in the public's response and attitudes to the interventions employed to help mitigate the drought. Distinguishing drivers can help explain why certain opinions and attitudes are expressed. In this study trust, fairness, and knowledge and information were key drivers, in addition to financial and health concerns. The key drivers were identified based on the frequency of occurrence in the comment sections as well as the content (including tone and the degree of emotion) within those discussions. Figure 4-6 below illustrates the number of comments mentioning or implying the key drivers.

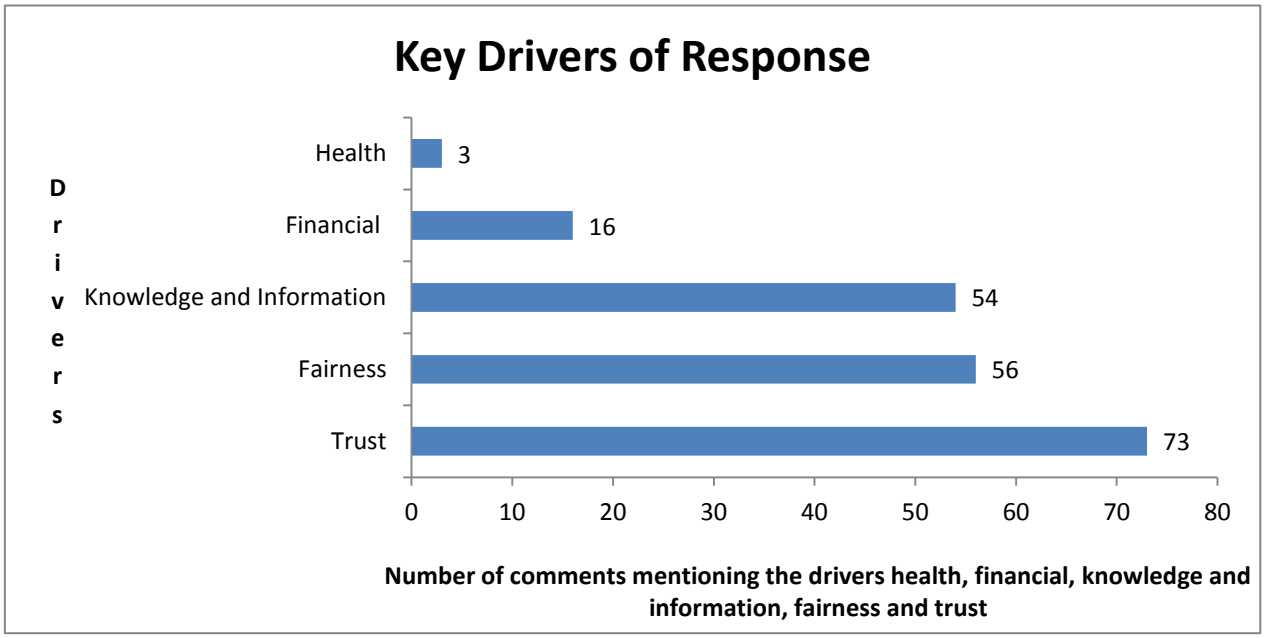

Figure 4-6 The key drivers of response identified in the comments sections

Knowledge and information

The driver 'knowledge and information' in this study comprises a variety of meanings as follows: (i) the knowledge and information that readers hold regarding an intervention (ii) the lack of knowledge and information regarding an

intervention and (iii) the knowledge and information the readers require regarding an intervention.

Many readers firmly believed that desalination should be part of the solution to mitigate the drought and justified their choice solely on the basis that much of the UK is in close proximity to the coast.

(C)B3-102 *If there's not enough rain, desalination is the answer. We are surrounded by the stuff.*

There was an absence of factual knowledge from the majority of supporters of desalination, particularly when compared to those who opposed the intervention. This may be because supporters of desalination did not feel the need to present factual information to justify what they believed to be an obvious choice. On the other hand it could imply that knowledge of the desalination process was poor amongst supporters of desalination. Despite the apparent low level of knowledge among pro-desalination advocates, only a small number stated that they would require more information, specifically regarding issues associated with the costs of building and running desalination plants and how this may affect water tariffs. In contrast, requests for additional information and knowledge concerning interventions such as water conservation were more evident.

(C) DM4-224 *People need information. How can they save water? How can they re-use water? i.e. from the shower etc.*

Many readers perceived that the hosepipe ban referred to a ban on activities in the garden rather than a means of conserving water both in the house and garden. In response, other readers expressed the need for education and communication campaigns, in particular concerning water conservation measures, and television campaigns were regarded as the best method of conveying the message to a wider audience.

(C)B1-26 *Why oh why is the media not used to educate people on how to conserve water?! All the advert breaks on commercial tv and breaks between*

programmes on BBC (TV and radio) are ideal opportunities to give little hints to everyone (children and adults) on how to save water..

On the other hand, there was some evidence of knowledge and understanding amongst some readers. For instance, one reader demonstrated an accurate knowledge of how an urban water supply system operates, while others exhibited factual knowledge of alternative water sources such as greywater recycling.

(C)DM4-50 *The current problems with low rainfall and an oversubscribed water supply have been a potential problem for numerous years now. Under investment in water conservation methods and the use of water as a means of generating cash has led to policies in water strategy which are ineffective in dealing with this problem. Water catchment facilities are inadequate in these highly populated areas. …*

The evidence that the some readers did not express or demonstrate knowledge and information regarding some interventions are consistent with those of Dolincar and Schafer, (2009) and Dolincar *et al,* (2011). In particular there was an absence of knowledge and information regarding the desalination process amongst those who advocated it. Many readers used the phrase 'we are surrounded by water' and the fact that much of the UK is within close proximity of the coast as the primary justification for the development of desalination plants. However, there may be another reason for absence of expressed knowledge; some people may have already accepted desalination as a means to augment water supply. Previous research has shown that where the level of knowledge is low people rely on their own general beliefs, knowledge and cultural predispositions to make decisions (Achterberg *et al,* 2010).

In contrast, many readers who opposed desalination presented lengthy, accurate accounts of the desalination process. Whilst many presented a balanced view of the benefits and disadvantages of the process, the majority of those who opposed desalination focussed firmly on the negative aspects of desalination, such as the environmental impacts and energy costs, possibly as a means to detract from the benefits and to persuade others to reject desalination.

Those readers who supported water conservation also requested better education and knowledge about both water conservation and water efficiency. This supports findings by Dolnicar and Schafer, (2009) and Achterberg *et al, (*2010) who found that the call for more knowledge includes a desire for more knowledge of the existence of an intervention and knowledge regarding the benefits, as well as the knowledge required to use or gain access to the intervention. However, previous studies have cautioned that more general knowledge does not automatically mean more support for an innovation because the way in which people evaluate technologies is embedded in a range of cultural dispositions. (Achterberg et al, 2010). Many readers regarded television campaigns as the best method for getting the message across to a wider audience. Yet, research by Nixon *et al, (*2009) into behavioural change and encouraging participation in recycling schemes, found that it was family and friends who were most influential in persuading people to accept an intervention, while provision of information from multiple sources is most effective. Furthermore, research in Australia by Dolincar and Hurlimann (2010c) into the sources people use to inform them of water issues found that individuals and organisations in water management are most influential, followed by family members, scientists, and friends. Subsequent studies (Dolnicar *et al,* 2011) found that the least influential and least trusted sources of information were government and politicians, which has significant implications for designing future information campaigns.

Trust

There was a strong correlation between trust, or rather lack of trust and responses to interventions to mitigate the drought. In fact the majority of comments around this driver implied the public's lack of trust and confidence in the water companies. This mistrust stemmed from privatisation of the water companies in 1989 in England and Wales. Ten newly privatized companies were formed and were free from government control but were, and still are, closely regulated. The privatization led to the creation of large regional

monopolies that did/do not allow their customers the option of choosing their service provider. Furthermore, privatization resulted in many takeovers and, as a result, many UK water companies are now run by foreign companies (Haughton, 2011). It is within this context that many members of the public expressed their mistrust of the water companies. Outrage at the removal of water management from direct state control to private companies still exists today, as does considerable public criticism of the independent water companies. For example, a number of readers were sceptical about the authenticity of the drought; many believed that the timing of the drought, coinciding with a proposal for the mandatory installation of water meters, was suspicious.

(C)B3-278 *Water companies are desperate to force water meters on all customers but can only do so in new builds. Having "droughts" are excellent PR to lobby for changes to the law to force meters on all households and these are only to the water companies benefit. So, are these droughts real?*

One reason for the opposition to water meters was the belief that their introduction would lead to an increase in water charges and subsequently increase profits for the water companies.

(C)B3-146 *Yet another call for compuls[o]ry water meters, to restrict usage of a resource just to make profit for the shareholders, of which the tariffs will be further increased when co[n]sumption falls..*

Moreover, members of the public were outraged over remuneration of senior water company management and board members and the lack of transparency regarding financial spending. This, coupled with what was regarded as inadequate investment in the infrastructure, also contributed to a loss of trust.

(C)GO11-30 *Privatisation sold off very cheaply to Tory backers effective monopolies with guaranteed cash-flows. The deal was they bid for franchises, were allowed defined price rises and had to invest in the infrastructure. Instead they paid themselves massive pay-rises and bonuses, made millions out of share issues and didn't invest in infrastructure.*

Hence, the analysis reveals that mistrust of the water companies is common. This may be due partly to inadequate communication between some water companies and their customers during non-drought events, but could also be driven by objections to the transfer of control of a public amenity to a private

company. Nevertheless, the implications are that the water companies have a sizeable task ahead of them in re-gaining public trust.

In the literature review trust as a driver related largely to confidence in the technical ability of an intervention or the perceived risk associated with a particular intervention, rather than trust in an organisation. Yet, the findings of this study indicate that the driver trust actually relates to a lack of trust in the UK water companies to provide sufficient quantities of water (rather than quality). Thus, trust is defined in this study as sharing values and motives, along with confidence that the water companies have the competence to do the job they have been entrusted to carry out. Previous studies have shown this to be a common consequence when there is a disruption to supply (Haughton, 1998; Siegrist *et al,* 2003, cited in Techneau, 2007).

Lack of trust in the water companies is also evident in Haughton's 1998 paper which examined the Yorkshire drought of 1995. One of his key conclusions was that there was a public crisis of confidence over water governance which was linked to privatization. This study exhibited similar findings and there is evidence of a general lack of confidence in water governance today. For example, in 1995 there was outrage at the removal of water management from direct state control to private companies; this outrage is still evident today, as is the considerable public criticism of the independent water companies. Many readers firmly lay the blame for the drought with the water companies, citing a lack of investment in infrastructure, leaking pipes and a lack of future planning as prime causes for the water shortages. Likewise Bell's (2009) study revealed that many of the discussions in the London newspapers concerned leakage in the pipe network and mis-management by the private companies. However, Bell's research found that the media focused on high leakage rates. In contrast, in this study, the media focused largely on the reduction in leakage rates whilst the readers were fixed on the amount of water lost to leakage. Interestingly both the current study and that of Bell found that Ofwat (The Water Services Regulation Authority), which is responsible for managing investment strategies and targets for reducing leakage, was not held accountable. This implies that

the public is unaware of the role that Ofwat plays as the economic regulator of the water and sewerage sectors in England and Wales.

Furthermore, both Haughton's study in 1995 and the current study revealed that members of the public were outraged over remuneration of senior water company management and board members, and many stated that they would ignore pleas to conserve water, since it was considered a means of preserving the private profits for shareholders and company directors. This infers that the lack of trust, in this case, relates to values and the motives of the water companies (Techneau, 2007), which could have negative implications for requests to adhere to future hosepipe bans and drought prevention plans.

The findings of the research also share other similarities with Bell's 2009 study, which exposed a high degree of resentment towards the hosepipe ban. Equally, some readers alluded to the fact that attempts to help consumers save water were a means of shifting the blame for the water shortages on to consumers and away from the water companies. Both studies reported strong hostility towards the water companies, and, in particular a lack of investment in infrastructure and planning. Likewise, as in Bell's study, water shortages were blamed on inadequate installation of water meters.

In summary, many of the findings of this study are consistent with those of Haughton (1998) and Bell (2006). However, in contrast to Bell's study, the majority of issues raised were prompted by the public not by the media. Yet, the fact that years later the same topics have been raised, implies that in the intervening period little has been done to educate, inform or alleviate public fears about drought events or to win public trust and confidence in the water companies. In essence, the author agrees with Siegrist, Earle & Gutcher, (2003) who state that public trust is a key driver in ensuring cooperative action on the part of customers (cited in Techneau, 2007). Yet, owing to the fact that water companies in England and Wales are privatized, and as such, need to satisfy shareholders by making a profit (and consumers are aware of this), trust may be more difficult to achieve (Techneau, 2007).

Fairness

The issue of fairness was widely evident in the data and included a range of concerns. These included the fairness perceived in paying for the volumes of water used (metering) and differential pricing, fairness regarding extending the hosepipe ban to all, businesses and householders alike, and lastly, the fairness over the redistribution of water from areas where it is abundant to areas where it is scarce.

The main discussions around fairness concerned the suggestion that a fairer approach to water pricing would be based on the volume of water consumed. This intervention resonated with many readers and was frequently coupled with the suggestion that a differential pricing tariff system should be implemented. Some readers recognised that there may have to be concessions for those on lower incomes.

(C)B3-63 *Domestic prices could be tiered so that households that use substantially more water than the average household for the Council Tax band the property is in get charged a higher rate per cubic metre for their water.*

(C)B3-246 *I think the argument for mandatory water metering is gaining ground….That way, some parity can be achieved - by penalising heavy users and rewarding light users. That way, we can choose whether to water our garden or take 10 showers...*

Many readers alluded to the unfairness that businesses were exempt from the hosepipe ban.

(C)DM4-132 *Why is it always the general public that have to put up with these restrictions, what about industry? I haven't heard anything about restrictions for them.*

(C)S7-41 *What puzzles me is that the car wash "industry" is exempt from the ban.*

Finally, readers in the North of the UK (some readers indicated their place of residence) where water was abundant, were concerned about the fairness of water transfers. They questioned that if large scale water transfers were to be established who would bear the cost, and stated that it should not be at the expense of the people of the North.

As in previous studies (Doron, 2011), the main issues of fairness concerned paying for water and everyone making an effort to reduce water use. The primary concern regarding fairness related to the issue of pricing. Many readers regarded paying for the volume of water consumed rather than having a fixed annual tariff to be a fairer system. This may be due in part to the fact that during the last thirty years there has been a shift from the supply of water services to citizens, to the sale of water to customers (Bakker, 2001), hence today, water is more likely to be regarded as a commodity rather than a natural resource.

The installation of water meters is linked to the issue of fairness as it is the prime means of quantifying the volume of water consumed; it is also regarded as a beneficial means of conserving water. Nonetheless, mandatory water meter installation runs the risk of ignoring those members of the population on low incomes and their ability to pay for water (Feldman, 2011). Other findings indicate that the introduction of differential pricing was also seen as a fair approach to paying for water, which is also similar to findings in Doron's (2011) study. However, few readers acknowledged that differential pricing may be an unfair system, because those who could afford to pay would not have to restrict their water consumption (if they so chose). On the other hand, those people with special circumstances, such as those in poor health (who may need to use more water but may be unable to pay the higher tariffs) or those on lower incomes may have to make a concerted effort to reduce the amount they use. Consequently, these households may feel under more pressure to reduce their water consumption.

The second issue regarding fairness concerned the application of the hosepipe ban to businesses and householders alike. Many readers were dismayed that the ban had not been extended to businesses, many of whom used large volumes of water, for example car washes. This has implications if the drought was prolonged, or for future drought, as householders may have become disillusioned that water conservation was falling to one societal group. Doron (2011) argues that co-operation is crucial to a fairer water system, which he

defines as being part of a collective scheme to protect and maintain water supply. In other words, it is the responsibility of society as a whole to conserve water. Lastly, fairness was also discussed in relation to the transfer of water from where it is abundant to where it is scarce, and is particularly evident among those readers from the North of the country. This particular issue of fairness is a pertinent one, as the unknown 'burden of impacts' (Feldman, 2011, p 140) that is the hidden consequence of water transfers such as, the environmental consequences may fall on those populations in the North (the providers), yet not affect the beneficiaries, namely the populations of the South. Even though the transfer of water is not currently an issue, in the future, if water transfers were to become more commonplace, this issue could become a growing source of dispute. In conclusion, the issues of fairness are salient and, according to Feldman (2011), public acceptance of an intervention requires fair, open and big issue transparent decision making where stakeholders have an opportunity to voice their opinions. Hence, the allocation of water resources needs to be conducted in a fair manner to ensure equality and to prevent conflict.

Financial risk

The financial driver also had a number of connotations associated with it. Firstly, many readers advocated the installation of a water meter or a water saving appliance not only as a means of saving water but, more commonly, to save money. Another popular suggestion by readers was the introduction of financial incentives to encourage water conservation. Comparisons were made with the renewable energy industry where grants are available to householders for the installation of solar panels to generate electricity, and which, at the same time, save the householders money on their electricity bills.

(C)Ti3-9 *Perhaps there should be some sort of incentive / grant scheme to install rainwater harvesting tanks? I'd be happy to have one, but just don't have a few spare thousand pounds to pay for it.*

The final financial driver was that of the cost associated with planning, building and maintaining the infrastructure.

(C)B1-140 *Conserving and redistributing water from high catchment areas is the obvious answer - expensive - yes - but necessary!*

Readers recognised that many of the interventions suggested were possible even though the cost associated with them was a limiting factor. Yet, some readers claimed that, despite the cost, investment would have to be made now and for future generations as it was likely that drought events would become more common in the future.

Hence, these findings imply, as earlier studies have shown (Yeh, 2007), that cost savings and financial incentives can be salient drivers in influencing the adoption of an intervention. Research by Lam (2006) found that higher income families were more likely to retrofit their homes with water saving appliances and equipment. Lam (2006) suggested that monetary incentives should be offered to people to install water efficient appliances. This study revealed the same thing, but in contrast to Lam's study it was readers who suggested that financial incentives may encourage people to install water conservation equipment.

The long term benefit of an intervention is an important factor taken into consideration by many readers when costs are high. For example, many readers acknowledged that the development of infrastructure projects such as desalination may be costly but were deemed essential for long term future requirements. Similarly, studies by Mourato et al (2004) found that many car drivers were prepared to pay a premium for a fuel cell vehicle because of the long term cost benefit.

Health risk

Surprisingly, comments referring to health concerns were in short supply. For instance, one reader expressed their anxiety about the health impacts of using less water, associating the conservation of water with a rise in disease. In

contrast, another reader asserted their confidence in the safety of desalinated water although they remarked that the taste was unpleasant. Furthermore, despite desalinated water being the second most popular suggested intervention, contrary to other studies, there was little concern over the health and safety aspects of this alternative water source, possibly owing to the fact that there is only one large scale desalination plant in the UK.

Likewise, comments referring to recycled water were in short supply; those that were included were positive.

(C)B1 -68 *Water is already being recycled. Each town along the river Thames takes water from the river, uses it, treats it and puts it back. By the time the water reaches the sea it has probably gone through a power station, two factories and three kidneys*

The fact that comments regarding health were in short supply is interesting because it is in sharp contrast to previous studies (Dolnicar & Schafer, 2009) where health issues and the 'yuk' factor particularly concerning recycled water were abundant. Yet this study's findings are comparable to Hills (2002) who found that exposure to recycled water and education can increase its acceptance, hence one explanation for a lack of comments regarding health concerns may be because recycled water has been in use for some time in some areas of the UK.

This study found few health concerns regarding desalinated water. This may be because, as discussed earlier, many readers may had already (subconsciously) accepted desalinated water as a viable alternative water source. Likewise, there were few health concerns raised in the comments regarding other alternative water sources such as greywater and rainwater harvesting; this may be because, as in former studies (Dolnicar and Schafer, 2009; Dolinicar and Hurlimann 2010a), most readers suggested using these alternative water sources for non-body contact purposes such as irrigation or washing cars. Those few comments that did refer to health concerns were comparable to previous studies in that they expressed apprehension regarding pathogens (Dishman *et al,* 1989, Alhumoud *et al,* 2003).

Consequently, the fact that comments regarding the health driver are scarce suggests that either health as a driver is not a concern to the public or that it is something of which they have little knowledge or awareness. Nevertheless, if alternative water sources were to become more commonplace in the UK water supply, health concerns as a driver to public response to an intervention may become an issue.

To conclude the study began with the premise that drivers of response influence public response to drought interventions. The data showed that there is strong evidence of driver of response within the comment sections. However owing to the methodology choice (online document, thus secondary data), it cannot be stated that the drivers are casual factors in influencing response to the drought interventions because the readers were not interviewed to determine if this was the case. However what can be stated is that there is evidence of correlation between the drivers of response and the public response to drought interventions. Moreover, due to the level of evidence within the data set it is likely that drivers of response are influencing public responses to interventions in this study.

Comparison to previous studies using online media

During February and March the media picked up the proposed hosepipe ban story both as a news item and as a means of communicating the ban to a larger audience. Many of the articles encouraged readers to provide their feedback and thoughts on the proposed ban. In this study the labels supporting (positive), opposing (negative) and unclear were used to categorize the comments. The findings of the current study are comparable with those of (Manosevitch & Walker, 2009) who argue that the comment sections of online news articles can offer a substantial amount of factual, narrative (personal experience associated with the issue under discussion), source (linked to other websites), values, position, and reasons (for or against), which are similar to this study's 'supporting', 'opposing' and ''unclear' comments (a description or explanation of an intervention, a solution offered by comments which neither supported nor

opposed the intervention, or, a description by readers of their experiences of a drought event or an intervention). Research by Ryfe (2006) shows that personal experiences are an important part of public discourse because they can help overcome barriers and help people understand the complexity of an issue through the process of personal reflection (cited in Manonsevitch & Walker, 2009). This was widely evident in those comments categorised as unclear. The findings of this study confirm that interactive journalism can provide insights that the original newspaper article did not consider, and can offer a variety of perspectives on a single issue (Manosevitch and Walker, 2009). This is evident in the variety and quantity of interventions suggested by the readers. Yet, like Manosevitch & Walker's (2009) study, the comment pages also elicited uninformed opinion and inaccurate information, thus reiterating the need for prudence when using this type of data.

In summary, this study set out to address how drought mitigation interventions are characterised and discussed in UK news articles and public comments and to determine the key drivers influencing those responses to interventions. It was motivated by strong empirical evidence (Domenech and Sauri, 2010; Hurlimann *et al,* 2009; Dishman *et al,* 1989;) that public response to interventions to help solve environmental problems such as drought are complex and varied and that acceptance of interventions is not guaranteed. Three key findings emerged from the study. Firstly, supply side interventions were emphasized by the public over demand side strategies. Secondly, that the key drivers associated with response to interventions in this study included knowledge and information, and trust and fairness. Lastly, despite many of the readers' discussions focusing on supply side interventions, a wide range of responses to the suggested interventions were evident in the data, indicating that mitigation and prevention of drought is complex and will require an integrated approach.

5 Conclusions

The aim of this research has been to enhance the understanding of public views on drought prevention and mitigation. More specifically it set out to answer the following research questions:

1. How are drought mitigation interventions characterised and discussed in UK news articles and public comments?

2. What are the key drivers influencing these responses to interventions?

5.1 Key lessons learned

Three major conclusions can be drawn from this study. The first conclusion is that, although the majority of public discussions within the comment sections largely focused on supply side strategies, there was much support for demand side strategies, particularly water conservation. Many readers were actively reducing their water consumption by engaging in water saving behaviours and by installing water saving equipment. This leads to the conclusion that there is no true consensus regarding the public favouring one type of intervention over another, as each intervention elicits a variety of responses. Moreover, the array of responses indicates that a variety of justifications would be needed for any one intervention option.

The second conclusion is that there is a correlation between drivers of response and their ability to influence responses to interventions. The study revealed that there is an association between lack of trust in the water companies and responses to potential interventions for easing the drought such as the hosepipe ban. This mistrust may be due to a number of reasons, for instance it may be an overspill of resentment for what is regarded as private ownership of a public amenity (there for the common good). It could also be as a result of the perceived lack of financial investment and transparency by the water companies. However, it may also be as a result of poor public relations on the

water companies' part for not communicating clear, timely, unambiguous information about their role and function as water suppliers.

The implications of this lack of trust are numerous; for example it can lead to resistance to a hosepipe ban since it may be considered as a means of preserving the private profits for shareholders and company directors. It can lead to a shift in attitudes where water is considered to be a commodity rather than a natural resource. This will have consequences for how water is perceived and valued in the future. Nevertheless, earlier studies (Marks, 2006) have shown that trust can be developed through education, material support and regular contact.

Equally, the data showed that there was a correlation between knowledge and information and responses to interventions in this study. Furthermore, to some extent, the driver knowledge and information worked in union with the driver trust because the lack of communications from the water companies left the public uninformed. Although there is a broad knowledge of the existence of interventions among readers, the findings lead to the conclusion that there were different levels and areas of knowledge and expertise within the population (Russell & Lux, 2009). Unless members of the public have access to impartial and unbiased information regarding interventions, they cannot make informed choices which may affect acceptance and implementation of interventions to help prevent and alleviate potential drought events. Therefore, these dissimilar knowledge levels have practical implications for water companies who should consider targeting messages to different audiences when designing future communications and education campaigns.

The final conclusion is that individual interventions can elicit a variety of responses from the public. This was evident from the array of responses which desalination provoked; some readers adamantly supported it, while others were firmly opposed. Moreover, the opinions of many readers were inconsistent; many comments implied that they resisted the hosepipe ban, yet their stated behaviours favoured water conservation. Lastly, there was evidence that an

individual's response can change over time (which can be a positive sign), in other words, response to intervention is not always static and can have an element of fluidity about it. This leads to the conclusion that response to interventions to mitigate drought is complex and varied.

The findings of the study have important implications for water companies and authorities when planning communications campaigns and future drought management plans. The first two recommendations are to some degree already undertaken; however the findings suggest that there is a need for improvement.

- Educational and public awareness programs should be designed to promote understanding and adoption of appropriate drought mitigation interventions and water conservation measures. Considerable thought should be given to the most appropriate (trusted) and effective channels to communicate future campaigns. Moreover multiple source of information and various methods of communications and dialogue may be required to fully inform the public.
- The water companies need to work harder at rebuilding relationships and regaining public trust by providing transparent, timely communications to the public throughout the year, not just in times of crisis
- Impartial, factual advice and information on the variety of drought interventions available needs to be made easily accessible so that the public can make informed decisions about interventions available to help alleviate drought.

The study has gone some way towards enhancing our understanding of public responses to drought mitigation interventions and in particular the role that drivers such as trust, and knowledge and information can play in that response. Furthermore, it demonstrates the variety of responses interventions can elicit from the general public, indicating that an assortment of approaches and interventions would need to be included in future drought management plans.

5.2 Strengths and limitations of the research

One of the strengths of the qualitative research approach was that it enabled an in-depth investigation of the topic. The outcomes were based on the public's perspective and not those of the researcher. Moreover, the utilisation of online media articles and their associated comments enabled the analysis of up-to-date contemporary opinion.

Nevertheless, there were a number of limitations that need to be considered. For instance, owing to the use of secondary online data it was not possible to determine the socio-demographics of readers. An ACORN analysis could have been carried out but it would have resulted in an educated guess rather than explicit, verifiable evidence. Having socio-demographic knowledge may have provided further insights into public response to drought interventions; for example, it may have been possible to determine if one demographic group favored one particular intervention strategy over another. Socio-demographic information can be useful in planning communications campaigns and can be used to differentiate key messages to demographic groups.

Another drawback with using online media data was that there was no opportunity to probe the readers for clarification of a term or phrase, or to ask follow up questions. Furthermore, due to the nature of data collection the media and the public were not afforded the same opportunity to indicate a preference or level of support for interventions.

Lastly, bias may have been a limiting factor for the research. The findings of qualitative research are subjective; they are interpreted and shaped by the researcher. As a consequence, the reliability and validity of the findings can be undermined by researcher bias. One problem caused by bias could be different interpretations of words and sentences which may have led to misunderstandings. To help reduce bias the researcher made a conscious effort to keep an open mind and to be objective.

5.3 Implications for future research

The study's findings highlight a number of topics for future research, most of all the need for further insights into public response to drought mitigation, which could be discovered with more in-depth empirical evidence. This could be achieved if future researchers expand the study to include follow-up questionnaires and in–depth interviews. Moreover, future researchers are advised to refine the approach and to focus on the most salient drivers of response from this research – trust, fairness, and knowledge and information.

Finally, the findings of the study indicate that the general public is of the opinion that the drought event of 2012 was an anomaly that would be short lived; long term drought events were not widely acknowledged. Hence, future researchers are encouraged to investigate public response and perspectives of long term drought events.

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APPENDICES

Appendix A - **Search Vocabulary**

Table A Search vocabulary

Search Vocabulary		
Innovation	Waste/ recycling/waste reduction	Behavioural change
Resistance	Energy/Alternative Fuelled vehicles/ micro-generation	Social acceptance
Acceptance	Water/alternative water sources	Barrier to acceptance
Adoption	Strategies to overcome resistance	Public preferences
Attitudes	History of Innovation	Apathy
Public response	Urban water innovations	Factors influencing response to innovation
Barriers to response	Community perspectives	Novelty
Approval	Social gap	Public opinion
Public perceptions	Public belief	Public attitudes

Appendix B **- Journals**

Table B List of journals used in literature review research strategy

Journal Title
Advances in Consumer Research
Ambio
Aquatic Science
Australian Planner
Basic and Applied Social Psychology
Decision Support Systems
Desalination
Ecological Economics
Ecology & Society
Energy Policy
Environmental Education Research
Environmental Management
Environmental Sciences
Eurobarmeter Reports
European Journal of Innovation Management
European Journal of Marketing
Futures
Global Environmental Change
Human Ecology Review
Journal of Business & Economic Research
Journal of Business Research
Journal of Economic Psychology
Journal of Environmental Planning and Management
Journal of Environmental Management
Journal of Public Affairs
Journal of Service Research
Psychological Bulletin
Renewable Energy

Research In Human Ecology
Resources, Conservation & Recycling
Society & Natural Resources
Society & Natural Resources
Technological Forecasting and Social Change
Technovation
The Journal of Consumer Marketing
The Journal of Product Innovation Management
Urban Ecosystem
Water Science & Technology