Investigating Effective Communication:

Exploring Individuals’ Cognitive Differences and Environmental Behaviours

Thesis submitted by

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The research presented in this thesis was conducted in accordance with the National Health and Medical Research Council (NHMRC) National Statement on Ethical Conduct in Human Research (2018), and the James Cook University Statement and Guidelines on Research Practice. The proposed research methodology received human research ethics approval from the James Cook University Human Research Ethics Committee (approval numbers H7118 and H7675).

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Statement of Contribution of Others

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1x live interview with ABC radio
JCU media release (May 2019)
Title: "How do Australians think about water?"
TropWater Newsletter (May 2020)
Title: "One size fits none: Tailoring messages to communicate environmental threats"
Australian River Restoration Centre Blog (June 2020)
Title: "One size fits none for water threat communication"
NSW Government Community Engagement and Communication department presentation (October 2021)
Title: "The challenges of communicating about water"

Abstract

Australia faces an increasing threat to its water security due to climatic events such as drought. Currently, there is minimal empirical research regarding effective communication in the water security context to increase water conservation behaviour in at-risk communities. Therefore, the current research project aimed to explore the complicated nature of individual threat perceptions of water and provide recommendations for communications in the water security context to encourage conservation behaviours.

To date, research around mitigation behaviour using a theoretical approach has occurred predominately in the health context. Study 1 aimed to investigate whether a well-utilised health behaviour prediction model, the extended parallel process model (EPPM), could predict water conservation behaviour. Study 1 was conducted in Townsville (Australia), which was currently in significant drought. Participants completed an online survey that asked questions about water usage behaviours, perceptions of how water restrictions were communicated, and concerns regarding water security at the time and in the future. The results from 363 participants found that the EPPM variables (threat, self-efficacy and response-efficacy) were significant predictors of water conservation behaviour, over and above demographic variables.

Study 1 also aimed to explore the EPPM's predictions by using the model's variables to group like-minded individuals and provide further threat-message recommendations to branch away from the previous 'one size fits all' approach to environmental campaigns. These groupings were based on common standings of perceived threat and efficacy to further understand people's perceptions of environmental events. Findings indicated that each group differed in their water conservation behaviour, with behavioural engagement in line with the EPPM predictions with respect to standings on threat and efficacy perceptions. The groups were also characterised according to their demographic profile and standings on variables

such as behavioural engagement and perceptions of responsibility. Recommendations for communications were made with respect to the unique differences of each group. This research informed and supported a more targeted approach to the communication of environmental threats, such as drought, to increase water conservation, as well as the EPPM's application in the environmental context.

Study 2 aimed to further explore the concept of threat in the water security context and understand how individuals perceive water and make decisions when threats are perceived as distant or hypothetical. Additionally, this study aimed to investigate a number of gaps and theoretical questions that resulted from Study 1, predominantly around the currency and hypothetical nature of environmental events. A pre-post experimental study was conducted whereby water security events were manipulated using the construal level theory (CLT) factors (temporal, spatial, social and hypothetical distances) in messages depicting a scenario (distal vs. proximal water security threats).

Participants (N= 299) in the Townsville region initially completed a pre-test that assessed their threat susceptibility, threat severity, response-efficacy, and self-efficacy perceptions in response to their 'current' water security issue/s in their town of residence. Participants were then randomly allocated to one of two vignettes that presented either proximal or distal water-related threat scenarios, viewing both vignettes by the end of the survey. Contrary to CLT predictions, the manipulation of psychological distance resulted in increased threat perceptions after exposure to the distal scenario. Additionally, the perceived experience of an event also appeared to affect threat perceptions, with those with previous experience of a water security threat exhibiting higher threat perceptions. Last, in terms of decision-making in the water security context, the application of CLT appears mixed. The results indicated that regardless of scenario presentation, individuals were more likely to choose feasible behaviours (the *how* line of thinking), rather than those that are decontextualized or abstract.

Based on the reviewed literature and the results from the current study, both theoretical and practical recommendations for developing effective communication in the water security context were made. Key recommendations for the project indicate that the EPPM appears to be a suitable model to apply in the context of water security. The model provides an appropriate theoretical foundation for threat message construction and the measurement of threat and efficacy constructs to predict behaviour in the face of water security threats. Furthermore, the project shows mixed results for the use of CLT in this context. Regardless, CLT components of spatial, temporal and social distances may be used in targeted messages encouraging water conservation behaviours. The results of this project increased the understanding of threat communication in the environmental context and perceptions of water, both of which facilitate water conservation behaviour.

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List of Abbreviations

AIDS – Acquired immune deficiency syndrome CLT – Construal level theory

CSIRO - The Commonwealth Scientific and Industrial Research Organisation

EPPM – Extended parallel process model

HIV – Human immunodeficiency virus

NEP – New Ecological Paradigm

PMT – Protection motivation theory

PPM – Parallel process model

SEQ – South East Queensland

TCC – Townsville City Council

TPB – Theory of planned behaviour

UN – United Nations

Chapter 1: Introduction

Many regions worldwide are experiencing an increase in the intensity of climate change related events, specifically those that are water-related, which carry an extensive array of negative effects (IPCC, 2022). These adverse effects can include temperature increases, shifts in the timing of river flow, dry conditions, increased storm-water run-off and sea-level rise (Bouwer, 2019; Brears, 2017). The adverse impacts of climate change are also documented to have major implications for freshwater resources, water management and overall water quality (Beeson, 2020; Gleick, 2012; Pearce et al., 2013). The vulnerability of a country's water supply is also partially mediated by individual consumption of the natural resource. Population growth and an increase in agricultural and industrial activities are argued to pressure already strained water supplies (Beeson, 2020; Gregory & Hall, 2011). As a result, there is a greater demand for, but a shrinking supply of, water, with the global demand for water projected to bypass supply by 40% in 2030 (Brears, 2017). Australians are not unfamiliar with climate-related events that negatively affect Australia's water security, with one of the most common and widespread climatic events in Australia being drought.

Drought can be defined as a natural hazard that is a "prolonged, abnormally dry period when the amount of water is insufficient to meet our normal use" (Bureau of Meteorology: Australian Government, 2019b). Australia, as a whole, has experienced significant periods of drought and water scarcity (the long-term result of drought) for several years. For example, 58% of Queensland and 16% of New South Wales experienced severe drought in 2018 (Steffen et al., 2018). The adverse effects of drought have also occurred in conjunction with a significant decrease in rainfall nationally over the last three decades, with the prediction of further reductions in the future (Bureau of Meteorology: Australian Government, 2018; Steffen et al., 2018). For example, there was a 26% decrease in rainfall from 2016 to 2017/18 (Australian Bureau of Statistics, 2020b), followed by the year 2019 being recorded as the country's driest in over a century (Bureau of Meteorology: Australian Government, 2019a). This reduced rainfall, combined with the forecast of rising temperatures in Australia, increases the country's likelihood of future water insecurity (CSIRO & Bureau of Meteorology: Australian Government, 2015). In addition, Australia has also been subject to a recent period of increased cloud cover, moisture and wind, known as a La Nina. As well as increased rainfall, a La Nina also presents a series of change in other environmental conditions, including a shift in temperature extremes and a greater risk of tropical cyclones (Bureau of Meteorology: Australian Government, 2016). The increased rainfall and risk of flooding has a considerable impact on the freshwater resources of Australia. For example, floodwaters produce an excess sediment, nutrients, and pollutants that may degrade aquatic habitats, lower water quality, and contaminate coastal food resources (Talbot et al., 2018). This presents another challenge to the water security of Australia both now and in the future, as La Nina events occur approximately every 5 years.

Despite the concerning weather patterns within the country, water is highly accessible to most of Australia’s population compared to other parts of the world. It is acknowledged that water security is a broad issue that has far-reaching global, national, community and individual impacts (CSIRO, 2011; UN Water, 2013). Water is considered a public resource, but water consumption is associated with personal or individual behaviour (Deng et al., 2017). On this basis, this thesis, both in terms of the examination of literature and statistical analysis, considers individual perceptions, experiences and behaviours on issues that may be regarded as global or widespread. In other words, the topics discussed can have an impact on a global or national level, but the consideration of impact for this thesis is at the personal level.

To understand how an individual may perceive the adverse effects on their water supply, what it means to have water security (or insecurity) should first be examined. There are differing views in the literature on what urban water security means and how it can be achieved (e.g., Allan et al., 2021; Brears, 2017; Gerlak et al., 2018). The United Nations (UN) defines water security as:

The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development; for ensuring protection against water-borne pollution and water-related disasters; and for preserving ecosystems in a climate of peace and political stability (United Nations, 2013, para. 1).

Within this working definition provided by the UN is a series of critical elements argued to be necessary to achieve and maintain water security. A component of particular interest to the current thesis states that water security is the capacity and ability to manage the uncertainties and risk of water-related hazards, for example, droughts and floods (UN Water, 2013). The *capacity* and *ability* mentioned above can be understood on many levels, including community and individual levels. At the community level, if a region has effective policies to deal with water-related hazards, such as limitations placed on water use implemented after a drop in water supply, then the region may be considered secure. At the individual level, if an individual can cope with the uncertainties and risks of water-related hazards by limiting their use and consumption and those behaviours do not impact their livelihoods, they may perceive their country, community, and/or themselves as having adequate water security measures and safeguards. This essential element will be adopted as the basis for defining water security in the current work with individual-level perceptions of primary focus.

With climatic events such as drought showing no signs of reprieve and having considerable direct and indirect impacts on the way Australians live, there have been substantial attempts to reduce the adverse effects of these events. Such efforts include implementing supply limits, technological advancements and water distribution structure changes (Beeson, 2020; CSIRO, 2011). For example, in 2021, the Australian Government committed $3.5 billion to fund water infrastructure for the country (Australian Government: Productivity Commission, 2021). Targeting human consumption through behaviour change is another strategy employed to reduce the effects of climatic events in Australia (Beeson, 2020). Adjusting human behaviour may mitigate the negative impact of events like drought and help protect Australia's water security. However, research on drought and human behaviour is commonly focused on the coping strategies and mental health consequences of those affected in terms of agricultural loss. There is little focus on actual water conservation behaviour measurement (Dolnicar & Hurlimann, 2010; Landon et al., 2016) or understanding layperson perceptions of water scarcity and conservation behaviour (Kneebone et al., 2020). Very little research has also focused on personal or community impacts (Murti et al., 2016), particularly in communities with little experience or exposure to water security threats or countries where water and access to water are taken for granted. Therefore, effective evidence-based strategies or interventions to reduce human consumption of water are limited and need to be explored further to produce behavioural change resulting in increased water security within Australia.

One such method that has been used to encourage water mitigation behaviour at a population level is threat or risk communication through local channels and the mass media (Abu Bakar et al., 2021). For instance, local government water restriction campaigns are constructed to highlight the water usage within a community and provide suggestions for conserving water in the home. These campaigns are constructed in an attempt to change behavioural and attitudinal norms by challenging an individual's traditional perception of water security and supply. For example, the 2007 eight-month "Target 140" campaign in South East Queensland (SEQ) targeted household water consumption through the distribution of print media, radio and television advertisements, as well as through the delivery of water-saving devices (Walton & Hume, 2011). Similarly, the 2020 “Every drop counts” campaign by Seqwater also promoted the curtailment of household water use in SEQ. This campaign featured an advertisement on the radio, buses and petrol pumps, SEQ television, Spotify, and YouTube (see https://youtu.be/Dr9BajqoQuY for an example of an advertisement from this campaign).

Threat or risk-based water-saving campaigns are among the most common techniques for promoting household water conservation (Koop et al., 2019; Syme et al., 2000). Generally, these messages have high threat components highlighting the negative impacts of behaviours to increase the audience’s fear emotions, yet they arguably do very little in increasing behaviour (Bamberg & Möser, 2007; Barr, 2006; Howell, 2014; Shanahan et al., 2000; Wallack, 1999). There is little evidence to suggest that current water-saving campaigns encourage anything more than reception or awareness among those more at risk (Syme et al., 2000). Campaigns that employ these methods are often termed “fear appeals” and attempt to use communication techniques that arouse fear emotions to promote self-protective behaviours (Rogers, 1983; Ruiter et al., 2001). These appeals are among the most widely used social marketing strategies to gain audience attention and encourage behaviour in many domains (Cho & Salmon, 2006; Li, 2014; Tay & Watson, 2002). Despite the frequency of these campaigns, it is questioned whether these methods effectively increase behaviour and, more importantly, whether they will continue to safeguard the country’s water supply in the future.

The continued use of fear-focused campaigns has been a concern for many decades for those who design and assess them due to the lack of scientific evaluation of this approach, the absence of a theoretical basis behind their construction and the significant costs associated with such strategies (Kidd et al., 2019; Syme et al., 2000). Although there has been limited research exploring this issue, the lack of reported success of fear appeals in the environmental space may be driven by the uncertain efficacious information contained within the messages. Environmental issues are generally not solved by virtue of a single action. As such, it is difficult for message creators or governing bodies to reassure individuals that *their* 'response' will result in the desired effect by simply including efficacy information (e.g., suggesting that using less water will minimise the immediate adverse impacts of drought). This is generally because these issues require collective action over an extended period to positively affect the environment (Gifford, 2011; Grunig, 1976). Additionally, the gratification of acting to reduce environmental threats is often distant, delayed or absent (Schafer & Schlichting, 2014).

Furthermore, in the water security context, theory-driven approaches regarding communication of such issues or understanding perceptions and behaviours have been applied minimally (e.g., Deng et al., 2017; Dolnicar & Hurlimann, 2009; Fielding et al., 2012; Mankad et al., 2013). Theoretically-driven communication approaches have been well adopted in the health context (Gore & Bracken, 2005; Hatchell et al., 2013; McKay et al., 2004), where it can be assumed that there are natural reinforcements should one choose to engage in health-protective behaviours (i.e., improved health). To best understand how to communicate information effectively in the water security context, one must understand how individuals perceive threats to their water security. One such behaviour change model which provides a theoretical basis for constructing threat communications by measuring perceptions and predicting outcomes (e.g., attitudes, behaviours or intentions) is the extended parallel process model (EPPM) (Witte, 1992). This model was constructed and intended to be used in the health context. Therefore, there has been a lack of application and scientific evaluation of its effectiveness in predicting cognitions and behaviours in the context of environmental issues more broadly, making it difficult to determine if a theoretical approach to risk message construction using this model in this context is effective. It is also unknown whether the elements of selected theories add to or assist in explaining behavioural prediction or measurement, specifically related to water use. These considerations, and many more (e.g., the large variability in how individuals perceive water-related threats (Cockerill et al., 2016)), are addressed throughout the thesis. Consequently, this thesis directly attempts to explore ways in which messages can be effectively created, specifically in the water security context, whilst considering the challenges of environmental communication.

Given that water management is often considered a technical challenge typically met by the industrial sector (Pearce et al., 2013), managing water through changing and addressing human perception is often less considered. Evaluating how individuals perceive environmental events that negatively impact Australia’s water security contributes to the management of the country's water supply. Therefore, the current research plans to investigate how individuals use water, their perception of it, and how this perception influences decision-making in the water security context. In aiming to understand individual water perceptions in the Australian context, via a case-study and using health behaviour change models as a basis, the novel approach of this thesis can be regarded as imperative and timely, given the increasing intensity of climatic events throughout Australia and their effect on the country’s water security.

In summary, the current thesis presents a novel way of assessing and exploring individual behaviour and perceptions in response to water security threats in an at-risk community to provide recommendations for more effective communications to improve Australian water security. This work considers and incorporates evidence from the environmental context, employing examples from the broader health and social marketing literature across nine chapters. The second chapter reviews the literature and history of population threat communication techniques, specifically focusing on the EPPM. Chapter 3 then examines the EPPM in the context of water security and establishes the first study's aims. Chapters 2 and 3 develop the hypotheses that led to Study 1 in chapter 4, which explores using the EPPM to predict water conservation behaviour and examines individual responses to a water security threat. Chapter 5 reviews the literature on audience segmentation and generates several hypotheses tested in chapter 6, focusing on individual differences in perceptions in this context. Chapter 7 introduces a new theory in the social marketing space and the environmental context, the construal level theory (CLT) (Trope & Liberman, 2010). This chapter develops multiple hypotheses explored and examined in chapter 8 (Study 2). Last, chapter 9 presents a general discussion of the overall project. This chapter discusses the outcomes, implications, limitations, and general conclusions of the entire project, emphasising environmental communication, individual cognition, and psychological theory.

Chapter 2: Communicating Threatening Information Using Behaviour Change Models

Fear appeals use persuasive communication techniques to arouse an unpleasant emotional state in an attempt to promote precautionary motivation and self-protective behaviours (Rogers, 1983; Ruiter et al., 2001). Fear appeals make up a fundamental element in risk communication by presenting the adverse outcomes or consequences of engaging in risky behaviour. Such communication attempts to present information that individuals may find threatening by emphasising the extreme, negative consequences of engaging in the targeted behaviours. These appeals aim to engender what can be considered a ‘healthy’ level of fear in their audience to encourage engagement with some type of mitigation behaviour (Rogers, 1975). Fear appeals have a long history of use in health behaviour promotion, road safety advertising, and awareness of how human behaviour negatively impacts the environment (e.g., Algie & Rossiter, 2010; Hart & Feldman, 2014; Lewis, Watson, & Tay, 2007; Lewis, Watson, Tay, et al., 2007; O'Neill & Nicholson-Cole, 2009; Rigby et al., 1989; Ross et al., 1990; Shanahan et al., 2000; Syme et al., 2000). It is hypothesised that changing an individual’s attitudes will persuade them to adopt healthier, safer or more environmentally friendly approaches to daily life and ultimately lead to improvements in individual health, safety or the environment (Lewis, Watson, & Tay, 2007).

The predicted effectiveness of a fear appeal is commonly attributed to the heightening of the viewer’s attention due to the dramatic events it portrays (O'Neill & Nicholson-Cole, 2009). However, it is argued by various researchers that this technique’s ability to actually change behaviour is questionable (Bamberg & Möser, 2007; Barr, 2006; Howell, 2014; Shanahan et al., 2000; Wallack, 1999). As the strategy is still frequently employed by policymakers, and there is some evidence supporting fear appeals in directing attention, it is worth examining the anatomy of an effective appeal and thus effective communication. The current chapter is a theoretical examination of fear appeals leading to a discussion on the most common and, what some would consider, the most effective theoretical frameworks used to construct and examine these appeals (Witte, 1992).

2.1 Anatomy of Fear Appeals: Essential Components of Effective Communication

There are three main components of a traditional fear appeal that should be included in a communication to maximise success. The first part of the fear appeal is the threat perception of an external stimulus that is perceived to be of danger or harm to an individual (Maloney et al., 2011; Witte, 1992). Recognition of information as threatening requires an individual's assessment of both the severity of and their susceptibility to the threatening event. Severity is defined as the level of harm an event/stimulus is likely to cause an individual or the event's seriousness. Susceptibility is defined as how likely an event will harm or influence an individual (Witte, 1992). The next part of this type of communication is fear, which is the emotional component elicited by the fear appeal (Witte, 1992). This emotion can be described as an individual’s sense of impending danger and the discomfort or apprehension caused by the threat perceived as significant and personally relevant (O'Neill & Nicholson-Cole, 2009; Witte, 1992). The final part of a fear appeal is the elicitation of efficacy perceptions in response to the fear message. Within perceived efficacy, it is hypothesised that there are two components; perceived self-efficacy and perceived response-efficacy (Witte, 1992). Perceived self-efficacy is defined as whether an individual perceives they could take action to divert a threat. In contrast, response-efficacy is defined as the perceived effectiveness of an action in reducing the impact of a threat (Witte, 1992).

Typically, the outcome assessed in traditional fear appeal research is message acceptance, which can be assessed by either a change in an individual’s attitude toward the stimulus, intention to engage in the target behaviour, or actual behaviour change in line with the message recommendations (Witte, 1992). Other outcomes less commonly assessed are defensive avoidance and reactance, which is an individual’s resistance to a message, and the explicit refusal to change due to perceived manipulation (Witte, 1992). The three components potentially contributing to an effective fear appeal are not always adhered to, and fear appeals are often criticised for their over-reliance on threat information to induce fear, inadequate efficacy components or the requirement of other variables to encourage behaviour change (e.g., Algie & Rossiter, 2010; O'Neill & Nicholson-Cole, 2009; Peters et al., 2013; Shanahan et al., 2000). These issues will be discussed in further detail below in the analysis of fear campaigns using this approach to produce behaviour change.

2.2 Criticisms of Fear Appeals

Fear appeals have mixed results regarding their power to persuade audiences (Ruiter et al., 2001; Witte & Allen, 2000). Of the criticisms mentioned in fear appeal literature, one that seems prominent is the lack of understanding of the relationships between factors that make up effective appeals. One of the most memorable public health campaigns guilty of this flaw is the 1987 Grim Reaper campaign developed by the National Advisory Committee on Acquired Immunodeficiency Syndrome (AIDS). This campaign was developed to motivate the Australian public to learn more about human immunodeficiency virus (HIV) and AIDS and take protective action to encourage safe sex (Rigby et al., 1989; see https://www.youtube.com/watch?v=U219eUIZ7Qo for the advertisement).

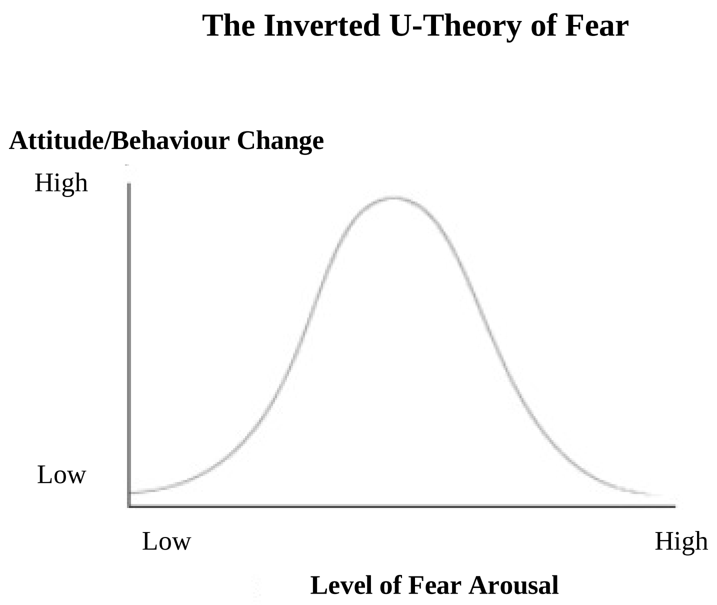
The Grim Reaper campaign was designed based on the belief that AIDS should be considered a personal threat to *all* individuals (Taylor, 1987). The campaign's centrepiece, which received considerable public exposure over a two-week period, was a TV advertisement set in a bowling alley (Rigby et al., 1989). It opened with a hooded Grim Reaper bowling down tenpins of ‘ordinary Australians’, including mothers holding babies, with a grimly voiced narrator stating that *anyone* could be killed by AIDS (Stylianou, 2010). The rationale behind the campaign’s construction and, more specifically, the Grim Reaper advertisement was simple: the more fear one experiences, the more likely an individual will be to adopt protective behaviours to avert the perceived threat (Rigby et al., 1989; Shanahan et al., 2000). This rationale was based on early theories in the fear appeal literature, commonly known as drive theories, which suggested that more fear leads to greater persuasion or motivation (Rigby et al., 1989).

The portrayal of death in this campaign shocked the nation and continues to be one of Australia's most memorable television advertisements (Stylianou, 2010), placing the issue of AIDS on the general public’s agenda. Although gaining overwhelming attention and spotlighting a topical subject at the time, this campaign failed in its attempt to influence targeted outcomes (Noble & Noble, 1988). For example, Shanahan et al. (2000) found the campaign did not produce behaviour change in those at high risk of HIV, while Rigby et al. (1989) and Ross et al. (1990) found no significant increase in concern around or knowledge of, the issue. While the advertisement had the components of an effective fear appeal, it is argued that fear was too heavily emphasised. Additionally, while the campaign increased attention about the issue, the seriousness of such a threat was not recognised by everyone at the time (Stylianou, 2010). Taken together, it seemed that the increased fear the audience was experiencing did not have the predicted effect on behaviour.

The evaluation of the Grim Reaper campaign made it evident that the relationship between fear and behaviour is not simplistic and that heightened fear-arousal may result in little behaviour or attitudinal change. It appears that for a fear appeal to be effective, a more complex framework than just that of arousing fear emotions needs to be applied. One suggested fear-behaviour relationship is known as the curvilinear or ‘inverted-U’ relationship, which was first coined by Janis and Feshbach in the early 1950s (Janis, 1967; Janis & Feshbach, 1953) and is illustrated in Figure 1**.** The inverted-U theory of fear hypothesises that fear arousal is necessary to motivate an individual to perform the required action. However, too much fear is predicted to lead to maladaptive outcomes (Janis, 1967; Janis & Feshbach, 1953).

Figure 1

Inverted-U Relationship Between Fear Arousal and Behaviour/Attitude Change (Janis, 1967; Janis & Feshbach, 1953)



As depicted in Figure 1, initially increasing the level of fear arousal would, in turn, increase changes in individual attitude or behaviour. Fear would increase until a critical point was reached, where an individual would exhibit an avoidance response, rejecting the message and resulting in low levels of attitude or behaviour change (Janis, 1967; Janis & Feshbach, 1953). To put into the context of the Grim Reaper campaign, this campaign was released when society had little knowledge about HIV/AIDS. Consequently, people also had little understanding of this disease's preventative behaviours and whether the suggested behaviours in the advertisement would effectively reduce the threat. Therefore, when referring to Figure 1, it can be argued that individuals were presumed to have reached a high level of fear arousal due to the ‘scariness’ of the advertisement itself, regardless of any other information presented. This high fear emotion, in turn, may have led to a low level of attitude change resulting in minimal behavioural compliance (Shanahan et al., 2000).

Although this theory was formulated over 70 years ago, the inverted-U theory hypothesis fell out of popularity in the subsequent decades due to a lack of support (Rogers, 1975). However, the relationship between fear and behaviour is arguably still relevant today. This relationship should be considered in the construction of risk communication where threats are large or perceived as affecting whole populations (e.g., in the environmental context). Such relationships may enable an explanation for behaviour (or lack thereof) in these contexts.

2.3 The Modern use of Fear-Appeals

Environmental events, such as drought, cyclones and, in a broader context, climate change, are considered significant issues that can affect individuals, communities and the world more broadly (Gleick, 2012). Behaviours such as conserving water may be encouraged in media campaigns to mitigate environmental events and reduce the risk to the general public. The environmental issue and its adverse effects, for example, a water supply at risk due to drought, is often conceptualised as a ‘threat’ to individuals. Additionally, behaviours such as conserving water are conceptualised as adaptive behaviours whereby individuals evaluate the ‘efficacy’ of performing such actions in terms of whether they may reduce the threat. The constructs of threat and efficacy that make up an effective behaviour change campaign have been widely acknowledged and applied in various contexts (e.g., Carey & Sarma, 2016; Gore & Bracken, 2005; Hatchell et al., 2013; McKay et al., 2004; Pedruzzi et al., 2016). However, these foundations for success have rarely been applied in the environmental context.

Road safety campaigns are particularly renowned for using fear-provoking graphic imagery to promote behaviour change. For example, The Transport Accident Commission in Australia constructed a series of highly emotional road safety commercials depicting graphic car crash scenes with mangled cars and bloodied bodies as a result of unsafe and illegal driving practices (Algie & Rossiter, 2010; Lewis, Watson, Tay, et al., 2007; Tay, 2005). However, these appeals are again based on the outdated assumption that more fear results in more behaviour (Lewis, Watson, Tay, et al., 2007; Tay & Watson, 2002). As a result, the success of road safety appeals is a contentious issue. Research conducted in Victoria, Australia, has suggested that the reduced number of road incidents can be attributed to these types of campaigns due to their ability to grab the audience's attention (Lewis, Watson, Tay, et al., 2007; Shanahan et al., 2000). However, no published evidence supports the assertion that individuals actually engage in the desired behaviour or exhibit maladaptive responses due to their exposure to advertising campaigns. In response to this, cognitive components of messages (i.e., how individuals perceive a message, or their attitude toward a message) have also been investigated extensively in road safety messaging (e.g., Carey & Sarma, 2016; Pedruzzi et al., 2016), assumedly in an attempt to move away from the traditional 'fear-only' approach to road-safety campaigns. These will be explored in further detail later.

In addition to the road safety context, limited research examining messages within the environmental context suggests fear appeals sometimes exhibit a lack of adherence to the components hypothesised to make up an effective appeal. This is shown in the research by Hart and Feldman (2014), who examined climate-related news reports using the variables within the EPPM (Witte, 1992). News report content was analysed on three United States television networks (ABC, CBS and NBC) over six-and-a-half years (Hart & Feldman, 2014). In total, 440 news transcripts discussing global climate change were analysed, and threat and efficacy information was coded to see trends (Hart & Feldman, 2014). Results found that although news reports spoke about the impacts of climate change (threat) and also possible actions to mitigate the effects (efficacy), both issues were rarely discussed in the same broadcast (Hart & Feldman, 2014). However, it should be noted that behaviour was not directly examined in this study.

As suggested earlier in this thesis, communications need both threat and efficacy information to engage individuals in an appropriate behavioural response (Witte, 1992). In the study by Hart and Feldman (2014), audiences were not given the complete information required to develop a desirable response to each climate-related message, not to mention that these were news reports and thus the intention was not to curb behaviour. Therefore, the likelihood of effective behavioural adaption would be minimal. The research by Hart and Feldman (2014) demonstrates that traditional forms of mass media, a common public news source, may not always include both threat and efficacy information in one message. As a result, there is likely to be minimal engagement with recommended behaviours, leaving issues such as climate change posing significant risks to the general public, given the adverse outcomes of climate change are exacerbated due to the lack of mitigation action. Whilst these conclusions are relevant in the context of the EPPM, they should also be considered in respect to the context of the study, where behaviour change was not the intention of the news reports nor examined in the research. Despite this, the research by Hart and Feldman (2014) is one of the few pieces of literature that has examined threat messages as they appear in the real world instead of fabricated advertisements or fear appeals constructed to push an agenda. As such, this example, and those addressed above in other contexts, highlight the need to construct theoretically driven communications to encourage individuals to engage in the desired response, given that traditional informational sources may be unlikely to do so.

The effectiveness of fear appeals in generating behaviour change has not been conclusively established (O'Neill & Nicholson-Cole, 2009; Ruiter et al., 2001; Syme et al., 2000). Risk communications are often modelled upon the perceived success of previous appeals that are predominantly based on the assumptions about the effects of fear on behaviour (i.e., more fear means more behaviour) (Ruiter et al., 2001). The evaluation of the Grim Reaper campaign, as well as the many other reviews on the ineffectiveness of the fear appeal approach (e.g., in the context of road safety and climate change; Algie & Rossiter, 2010; Hart & Feldman, 2014) and climate change (Hart & Feldman, 2014)), as well as the disregard for the theory proposed by Janis and Feshbach (1953), demonstrate that this approach to behaviour change may not be driven by a clear evidence-base (O'Neill & Nicholson-Cole, 2009).

The gap in understanding of the fear-behaviour relationship is not novel, yet it could be argued that it is often ignored. Contemporary research on fear appeals has focused on variables that moderate the fear-behaviour relationship, such as cognitive factors (e.g., Dolnicar & Hurlimann, 2009; Mankad et al., 2013). This approach may provide a more concrete foundation for constructing and evaluating such appeals and result in desired behaviour change. Understanding the theoretical basis of an individual's response to a fear appeal may also increase the replicability of successful appeals and allow for a greater understanding of the specific factors that feed into behaviour. Many theoretical models examine individual cognitive factors (e.g., threat and efficacy constructs) in predicting behaviour. Below is a brief outline of such models leading to a discussion on the model argued as the most effective for behaviour change in risk communication.

2.4 Behaviour Change Models

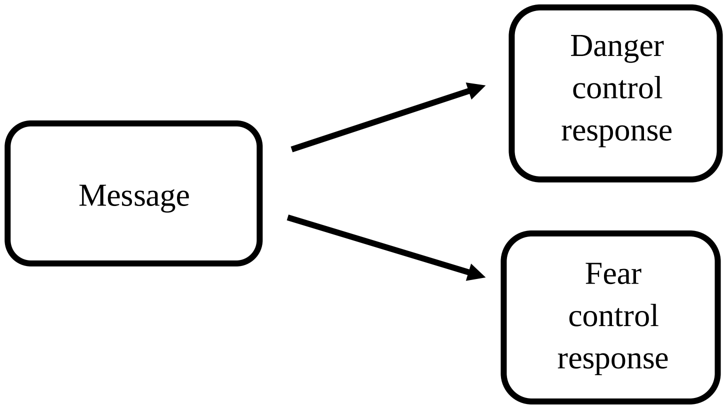
Drive theories hypothesise that fear arousal is necessary to promote action, with too much fear leading to maladaptive responses (Witte & Allen, 2000). Therefore, a moderate amount of fear arousal is required to achieve an appropriate adaptive response, such as defined in the inverted-U-theory of fear shown in Figure 1 (Janis, 1967; Janis & Feshbach, 1953). A lack of support for this simplistic representation of the relationship between fear and adaptive behaviour resulted in the rejection of traditional drive theories (Rogers, 1975; Witte, 1992), which only used fear in an attempt to alter behaviour. However, the relationship between fear and behaviour, as depicted by Janis and Feshbach (1953) and Janis (1967), is argued to still be relevant in conjunction with other moderating factors (Leventhal, 1970; Witte, 1992). As a result, theories began to adapt and integrate cognitive constructs and emotional responses to assist in the explanation of individual responses to fear appeals, with Leventhal's parallel process model (PPM) (Leventhal, 1970) laying the foundation for fear appeal construction. As they stand today, these theories and models are considered to offer a concrete foundation for developing and evaluating fear appeals.

2.4.1 Parallel Process Model

The PPM, as illustrated in Figure 2, focuses on an individual's cognitive processing of threat messages (Leventhal, 1970). The PPM was the first predictive model to separate an individual's emotional and cognitive processes concerning fear responses (Witte & Allen, 2000). The model was based on the premise that protective and adaptive behaviour stems from a person's attempt to control the threat (Leventhal, 1970). It was hypothesised that if people thought about the threatening message and employed behavioural or cognitive strategies to change the event's perceived impact, they would engage in the danger control response (Leventhal, 1970). In contrast, a fear control response is where an individual engages in avoidance behaviours to eliminate fear, making no progress in controlling the initial threatening event (Leventhal, 1970). Leventhal stated that fear communication often presented information about a dangerous event and how to avoid such an event. However, Leventhal did not explicitly relate these components to the theoretical concepts of fear and danger control or specify how these presentations affected the two responses (Rogers, 1975; Witte & Allen, 2000). As a result, this model has been considered untestable due to its lack of specificity regarding the stimulus variables required to initiate each process (Beck & Frankel, 1981; Rogers, 1975). Regardless, the PPM did lay the foundations for future fear communication research and coping theory, through the continued examination of “danger control” responses in later models, for example, the protection motivation theory and EPPM.

Figure 2

Leventhal’s Parallel Process Model (Leventhal, 1970)



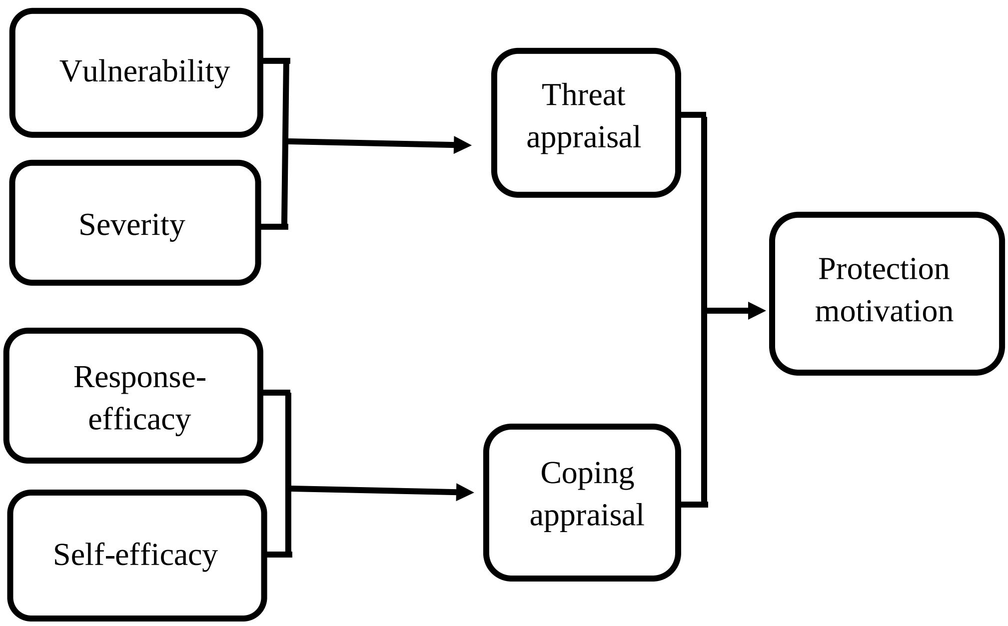
2.4.2 Protection Motivation Theory

The work of Leventhal (1970) was elaborated further by Rogers (1975) via the development of the protection motivation theory (PMT), which was the first theory to distinguish between the components of a fear appeal. The PMT’s main aim was to explain why individuals chose to make decisions to protect themselves from dangerous or harmful events. The PMT hypothesises that threat messages activate two mediating cognitive processes, which together constitute a danger control response or protective motivation (Rogers, 1975), as illustrated in Figure 3. These cognitive processes facilitate message acceptance and specify when an individual would engage in a danger control response (Rogers, 1975). This is opposed to its predecessor, the PPM, which only examined the cognitive processing of events rather than the components that mediate such processing.

The first process of the PMT is the threat appraisal, defined as an individual’s assessment of their vulnerability to and severity of the threat (Ruiter et al., 2001). The second hypothesised process is the coping appraisal, which is defined as an individual’s assessment of the effectiveness of a response (response-efficacy) and ability to conduct the appropriate action successfully (self-efficacy) (Ruiter et al., 2001). These cognitive processes are argued to generate ‘protection motivation’, which arouses, sustains and directs individual action (Rogers, 1975). The model predicts that the higher an individual's self-efficacy and response-efficacy perception, the more likely they will engage in adaptive behaviours, termed protective motivation (Rogers, 1975).

Figure 3

Roger’s Protection Motivation Theory (Rogers, 1983)



The PMT was subsequently revised with the addition of a rewards appraisal component. The rewards appraisal was conceptualised as part of the threat appraisal process and referred to the rewards gained by not performing the desired response (Rogers, 1983). Additionally, a perceived cost component was also added in the revision. This component was suggested to be part of the coping appraisal process and was defined as the cost of engaging in the desired response. The cost component included barriers such as inconvenience and time (Rogers, 1983).

Although this model was originally designed as an explanatory framework for fear appeal research, it has also been used to explain the decision-making process and to predict behavioural intentions in health research (e.g., Maddux, 1993; Wu et al., 2014). Evidence of the predictive utility of the PMT also extends beyond health behaviours to individual pro-environmental behaviour (Kim et al., 2013; Mankad et al., 2013). Although the theory has been effective in predicting behaviour, the revised PMT is argued to be flawed as it does not explain how or why an interaction between threat and coping appraisals may produce protection motivation (Witte, 1992). If both appraisal processes are high, according to the model, intentions to change the behaviour would also be high, potentially resulting in positive behaviour change. However, if the coping appraisal is high (e.g., quitting smoking) and the threat appraisal is low (e.g., continuing to smoke), according to the model, this would result in an illogical and unusual sequence of behaviour (Witte, 1992). The model does not address how the interaction between the two appraisal processes relates to protection motivation, nor does it explain the link between appraisal and behaviour.

Even more concerning is that the PMT focuses solely on danger control responses, as previously proposed by Leventhal (1970). Rogers (1975); (1983) made no attempt at addressing why fear appeals may *fail* to engage individuals in protective behaviour (Cismaru et al., 2008). Witte (1992) stated that fear arousal is the key to understanding when and why fear appeals work and fail, with this emotional aspect overlooked in previous fear appeal theories. Witte (1992) addressed the need to develop a model that also defined an individual's emotional influence on their behavioural response and included an approach that examines fear control responses or how individuals deal with threats through defensive avoidance or denial. The EPPM (Witte, 1992) was a result of this observation and proposed a sequential model of information processing that includes Rogers' (1975) PMT but also incorporates the PPM developed by Leventhal (1970) to explain the efficacy of fear appeals.

2.4.3 Extended Parallel Process Model

The EPPM (Witte, 1992) was developed to explain the inconsistent results in earlier fear appeal research (Maloney et al., 2011) and is argued to offer a more precise explanation of individual processing of fear appeals than the PMT (Rogers, 1975) and the PPM (Leventhal, 1970). The EPPM expands on previous approaches by specifying the relationship between threat and efficacy and re-incorporating fear (emotion) as the model's central variable (Witte, 1992). Additionally, the EPPM makes specific predictions about which of the three response types individuals may engage in (no response, fear control response or danger control response) depending on the interaction between an individual’s threat and efficacy perceptions in response to a threat message.

According to the EPPM, the threat component is conceptualised as a property of the message itself, and ‘fear’ is an individual’s emotional response to the message. The very premise of the EPPM is that high (or low) threat components within a message exhibit high (or low) fear perceptions. Additionally, the EPPM also assumes an additive relationship between threat and efficacy variables (Witte, 1992), in contrast to its predecessor, the PMT. This means that the *combination* of the variables (in an additive manner) will likely produce the desired outcomes. For example, a message that is perceived as highly threatening and engages a high efficacy perception will be the most effective in terms of behaviour change (Witte, 1992). This premise is discussed considerably in the literature (e.g., Popova, 2012; Witte & Allen, 2000); however, for the purpose of this thesis, an additive relationship will be assumed following the consensus of previous empirical research using the model. An in-depth explanation of each component and a description of how they have been conceptualised in the water security context is presented below.

Threat. According to the EPPM, threat information is classified as an event perceived as dangerous or harmful to an individual (Witte, 1992). What should be noted is that this is an individual’s *perception* or *appraisal* of a threat rather than an assessment of the objective nature of the threat posed. Witte (1992) proposed that risk was objective but directly impacted the viewer’s threat perception. The threat component of the EPPM is comprised of two elements: an individual’s perceived susceptibility to and the severity of a risk. Susceptibility is defined as how likely an event is perceived to harm or influence an individual, and severity is defined as how much perceived harm an event/stimulus is likely to cause an individual (Witte, 1992). According to the EPPM, a threat message will provoke action as it will convince those who receive it that they are susceptible to or at risk of the severe consequences of the threat (Witte, 1992).

Efficacy. The second component of the EPPM is perceived efficacy, which determines the *type* of action an individual will take in response to a threat. These actions are directly affected by the message components and level of threat perception. In the EPPM, efficacy is comprised of two factors, self-efficacy and response-efficacy. Self-efficacy is defined as whether an individual perceives they can take action, and response-efficacy is defined as the action's perceived effectiveness if it is taken (Witte, 1992). In sum, an individual’s *motivation to act* in response to a threat message depends on the degree to which a message increases their perception of a threat. The *type of action* individuals take is hypothesised to rely on the degree to which the message increases perceived efficacy to avert the threat posed. If a threat is perceived, the individual will be motivated to engage in the recommended protective behaviour. If confidence (self-efficacy) is evoked and the behaviour suggested is considered effective in terms of mitigating the perceived threat (response-efficacy), then an individual is hypothesised to subsequently select the appropriate type of action to avert the threatening event. This progression is shown in Figure 4**.**

Behavioural Responses. According to the EPPM, on exposure to a fear appeal, individuals are hypothesised to respond in one of three ways: no response, performing a fear control response, or a danger control response. As described in previous sections, upon the presentation of a fear appeal, individuals first engage in a threat assessment to determine their susceptibility to and the severity of the threat. If no threat is perceived, individuals will not proceed to engage in additional evaluations and, therefore, will have no response (Witte, 1992), as shown in Figure 4.

According to the EPPM, and in the context of water security, the fear control response occurs when an individual has perceived the water-related event as threatening and experiences the emotion of fear. However, the individual perceives that they do not have the appropriate or necessary efficacy information to prevent the threat. In this instance, an individual engages in maladaptive behaviour, such as denial or avoidance of the threat (Hart & Feldman, 2014; Witte, 1992). These actions do not address the threat itself but instead aim to reduce negative emotion in the short term and may be associated with long-term inner feelings of distress or anxiety (Hart & Feldman, 2014). Alternatively, a danger control response would occur when an individual perceives an event as threatening, experiences fear, and believes they can take action and that this action is effective in averting the threat. These actions often are in accordance with the message recommendations and attempt to reduce the threat directly (Witte, 1992). In the context of this thesis, these individuals would most likely perform adaptive behaviour that directly mitigates the water security threat, for example, engagement in water conservation behaviour. To summarise and to put further into the context of water security, a conceptualisation of the EPPM is shown in Figure 4 and Table 1.

Figure 4

The EPPM (Witte, 1992) Adapted for a Water-Related Event

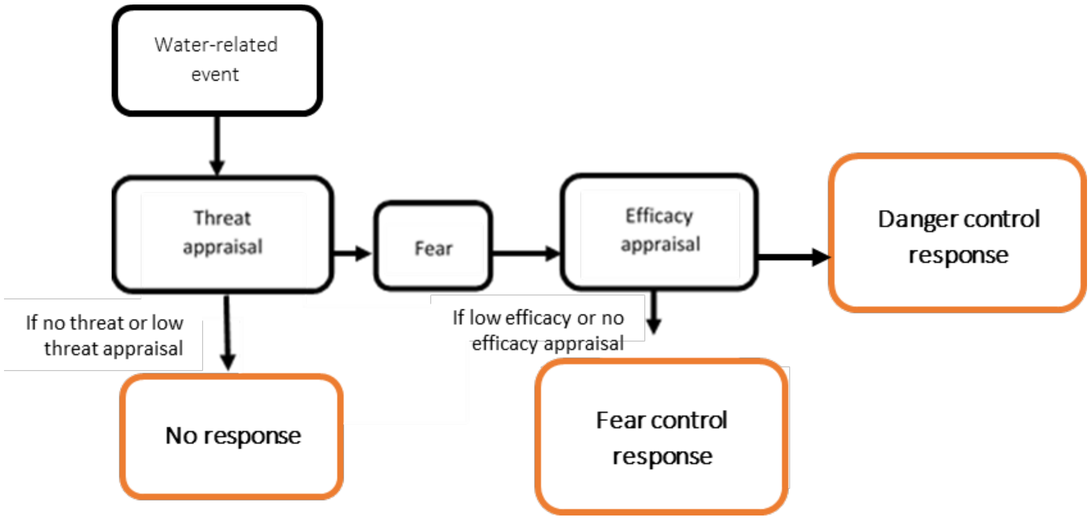


Table 1

Conceptualisation of Message Components and Behavioural Outcomes According to the EPPM

Message Components		Behavioural response
Threat	Efficacy	
X	X	No behavioural response
✓	X	Fear control response
✓	✓	Danger control response

Although outlining potential pathways to behaviours, the EPPM was established to predict *intentions* to engage in protective or defensive behaviour, not behaviour itself (Witte, 1992). There is some support within the literature for the use of the model in predicting or explaining variability in actual behaviour (e.g., McKay et al. (2004) and Carey and Sarma (2016)). Regardless, the gap between the measurement of intention to behave and actual behaviour cannot be ignored. The discrepancy between an individual's intention to behave and their actual behaviour can be argued to be dependent on an individual's perception that they can actually *do* such behaviours, otherwise known as self-efficacy perceptions (Witte, 1992). This particular element is included in the EPPM and is an important consideration for using this model in the environmental context, as will be later examined. To summarise, the EPPM's ability to determine the effect of threat perceptions on behaviour, coupled with its ability to predict maladaptive responses, unlike its predecessors (e.g., the PMT), makes the model desirable for use in the water security context.

2.5 Concluding Remarks

Behaviour change models other than the EPPM have shown merit in their ability to predict behaviour, attitudes and intentions (e.g., Kim et al., 2013; Maddux, 1993; Wu et al., 2014). However, this chapter shows these models also contain considerable flaws. For example, the PMT does not account for or explain why some individuals show 'no engagement' in behaviour. The EPPM adds three points of difference to its predecessors by explaining why fear appeals may not result in the desired behaviour, re-incorporating fear as a central variable, and clearly specifying the relationship between threat and efficacy (Witte, 1992). As a result, this model is argued to enable a more comprehensive examination of behaviour than its predecessors. This chapter demonstrates how the relationship between threat and efficacy variables, as hypothesised by the EPPM, may be able to assist in the explanation of individual responses to water-related threats. The following chapter will examine the EPPM further by reviewing empirical research using the model in the environmental context and its application in analysing behavioural responses to real-world events.

Chapter 3: Application of the EPPM

The previous chapter highlights how the EPPM attempts to explain individual responses to fear appeals. Of particular interest to the current research is the use of the model in the environmental context. In the environmental context, fear appeals have been used in campaigns to encourage mitigation behaviour in the face of climate change with variable success (Hart & Feldman, 2014; O'Neill & Nicholson-Cole, 2009; Scharks, 2016). These mixed findings may be because environmental issues are argued to elicit fear due to their perceived enormity, uncertain consequences, uncontrollability and high stakes (Lorenzoni et al., 2007). An overwhelming fear emotion towards environmental events may result in an individual's inability to perceive that they can avert the threat when faced with images of potential disastrous effects (Katz-Kimchi & Atkinson, 2014). Additionally, the gratification of acting to reduce environmental threats is often distant, delayed or absent (Schafer & Schlichting, 2014), which has negative implications for engagement in associated behaviours. Some literature suggests that using a fearful representation of climate change may be counterproductive because of such factors (Moser & Dilling, 2004). These points present several considerations for the development of communications in the environmental context, which have often not included all elements necessary for success nor been evaluated in great depth. Given that the EPPM explains both the maladaptive and adaptive responses of fear appeals, this model may be useful for assessing individual responses to fear appeals in the environmental context. More importantly, this model may also assist in the evaluation of responses to threatening environmental events as they present themselves in the real world.

The EPPM has been used to evaluate fear appeals and predict and explain intentions, attitudes, and behaviour in response to fear appeals for over 20 years (e.g., Basil et al., 2013; Batchelder & Matusitz, 2014; Gharlipour et al., 2015; Gore & Bracken, 2005; Roberto et al., 2019). A discussion of the application of the model is highlighted below, which starts from the model's traditional application in the health context, where an abundance of empirical work has already established its effectiveness (e.g., Batchelder & Matusitz, 2014; Gharlipour et al., 2015; Hatchell et al., 2013; McKay et al., 2004; Roberto et al., 2019). The following section will then focus on the critical points of the inclusion of efficacy information and the measurement of baseline cognitions to provide the rationale for using the model in the current thesis. This brief review will then be followed by an examination of the model's transition to contexts with less personal control to establish the research aims for the first study of this thesis.

3.1 Traditional Applications

The EPPM has been used to guide decisions about public communication campaigns in the health context and has served as a foundation for many empirical studies examining health behaviours. In such research, efficacy information seems to be the catalyst for individual engagement in desired responses (e.g., Gore & Bracken, 2005; Hatchell et al., 2013; McKay et al., 2004; Roberto et al., 2019). For instance, McKay et al. (2004) examined responses to information received by at-risk cardiovascular disease patients who have elevated vitamin levels (specifically, plasma homocysteine). The researchers were interested in increasing individual compliance with therapeutic regimes via manipulating the written information given to patients about their condition using the mechanisms of the EPPM (McKay et al., 2004).

Upon completion of a two-month multi-vitamin/mineral supplement clinical trial, participants received a letter containing threat information about their elevated plasma homocysteine concentration and were asked to read one of two pamphlets: one containing a high threat/low efficacy message and the other a high threat/high efficacy message. Participants then completed a questionnaire, which evaluated their perception of the pamphlet based on the EPPM variables of threat, self- and response-efficacy, among other variables

(McKay et al., 2004). Results found that those who received the high efficacy message with their threat information believed that the risk of developing cardiovascular disease could be averted. Further, positive attitudes, intentions and behaviours regarding the daily use of multivitamins were also higher in this group compared to those who received a high threat/low efficacy message (McKay et al., 2004). Therefore, these findings suggest that participants were likely to engage in the danger control process, as predicted using the EPPM framework, with efficacy appearing to be a key component of behavioural engagement.

In contrast, attitudes, intentions, and behaviours regarding the consumption of B-vitamin-rich foods were not affected by the high efficacy message. Individuals felt more confident taking a pill than consuming Vitamin B- rich foods (McKay et al., 2004). Contrary to the predictions of the EPPM, this finding suggests that the mechanisms of the EPPM may not apply to all health-related threats. It could be assumed that individuals may not be knowledgeable about foods containing high Vitamin B levels or the benefits of consuming such foods. This is opposed to consuming vitamin supplements that come attached with health information, often outlining the explicit benefits of consumption. Therefore, efficacy information may play a more prominent role in behaviour that individuals have little knowledge about, as the cost of performing some behaviours outweighed the perceived efficacy of engaging in the behaviour (McKay et al., 2004). The results of this study show some support for the inclusion and integration of both threat and efficacy variables to increase behaviour change in the health context. It also demonstrates how the appropriate combination of the two variables can direct responses effectively.

Another example of the importance of the inclusion of efficacy information is shown in the study by Hatchell et al. (2013), which also measured behaviour change post-intervention. Hatchell et al. (2013) examined the effectiveness of messages constructed based on the EPPM variables in increasing men’s physical activity intentions and behaviour. The research was based on the premise that, compared to women, men have an increased risk of morbidity and mortality, given their tendency to participate in risky health behaviour (e.g.,, alcohol abuse and smoking) (Hatchell et al., 2013). The randomised experiment separated participants into four groups, with each group receiving information targeting risk (high/no) and efficacy (high/low) information about a health condition (e.g., obesity or erectile dysfunction) and the role of physical activity in decreasing the risk of condition development (Hatchell et al., 2013). Both the high and low efficacy messages included the Canadian Physical Activity Guidelines (Government of Canada, n.d.) and discussed the effectiveness of physical activity for decreasing the risk of each health condition. The high-risk message presented statistics and facts about each health condition. The high efficacy message provided an example and demonstration of a physical activity and an explanation of how that may be incorporated into a daily routine (self-efficacy), as well as how that activity would lessen the risk of developing the specific health condition (response-efficacy) (Hatchell et al., 2013).

Participants first completed a physical activity baseline questionnaire and were presented with one of the four message conditions, followed by a request to complete a fear and defensive avoidance measure. This procedure was repeated for the following three days. On day five, participants completed a follow-up questionnaire that measured physical activity intentions, followed by a follow-up questionnaire on day 14 that assessed physical activity (Hatchell et al., 2013). Results showed that participants who received risk information and low efficacy messages were less likely to meet the physical activity guidelines on follow-up than those who received no risk information combined with low efficacy messages (Hatchell et al., 2013).

This finding is consistent with the predictions of the EPPM in that risk information about threats may evoke emotions of fear that restrict an individual’s ability to engage in the evaluation of efficacy message components. In addition, when presented with low efficacy messages, individuals may not be convinced that changing their behaviour would mitigate the risks presented. They may also engage in maladaptive strategies to cope with their fear responses. Another explanation for this result is that the participants in this study may have held elevated pre-existing fear emotions towards these health conditions, which could be assumed given the men's increased risk of morbidity and mortality due to risky health behaviour. As the health threats may be particularly salient for this population, exposure to more threat information may have further exacerbated fear and, together with the minimal efficacy information provided, contributed to maladaptive behaviour. This result emphasises the importance of combining risk information with high-level efficacy messages to achieve the desired behavioural outcomes.

The research by McKay et al. (2004) demonstrates how messages in the health context need to contain simple, well-known information and be targeted to the population to be successful. Similarly, the research by Hatchell et al. (2013) also demonstrates how the EPPM can explain individual responses, even those that are undesirable, to fear appeals in the health context. This research also supports the premise that too much fear can be maladaptive and that personal and salient threats may have an undesirable behavioural outcome.

Further research by Roberto et al. (2019) also provides evidence for using the EPPM to guide message construction in the health context. Roberto et al. (2019) manipulated the EPPM variables and measured influenza vaccine uptake behaviour. Participants were randomly assigned to one of the four conditions (high threat/low efficacy, low threat/low efficacy, high threat/ high efficacy, and low threat/high efficacy). After reading a manipulated message according to group membership, participants completed a survey measuring perceived fear, threat severity, threat susceptibility, self-efficacy, response-efficacy, and attitudes toward and intentions to obtain an influenza vaccine in the following

30 days. Participants were contacted 30 days later and asked to complete the second survey, which measured whether they had received an influenza vaccine in the past 30 days (Roberto et al., 2019).

Results found that participants in the high threat conditions reported greater perceived fear, severity, and susceptibility than individuals in the low threat condition. It was also found that participants in the high-efficacy conditions reported greater self- and response-efficacy than those in the low-efficacy condition (Roberto et al., 2019). Additionally, in terms of the predicted interaction between EPPM variables, results indicated that the threat and efficacy interaction was not observed for influenza vaccine attitudes, intentions, or behaviours in the sample. Instead, there was a main effect for efficacy (but not threat) on attitudes and intentions and no effect for either efficacy or threat on behaviour, providing mixed evidence for behaviour change (Roberto et al., 2019). Overall, while the fear appeal messages used in the study successfully increased perceptions of fear, threat, and efficacy, they did not lead to the theorised threat and efficacy interaction for attitudes, intentions, or behaviour for influenza vaccine uptake (Roberto et al., 2019). One reason for this outcome may be that the behaviour of getting an influenza vaccine needs to be performed annually, and several persuasive messages accompany each year’s flu season. Repeated exposure to these messages is argued to desensitise viewers to the threat (Roberto et al., 2019). Perhaps in this instance, understanding individual perceptions of the threat before presenting a message may assist in behavioural uptake - a consideration discussed later in this thesis.

The above research shows that messages designed with the EPPM variables impact individuals' cognitions toward health outcomes but produce mixed results regarding outcome behaviour, intentions or attitudes (Hatchell et al., 2013; McKay et al., 2004; Roberto et al., 2019). Despite the limitations, the studies outlined above highlight the diversity of the application of the EPPM in the health context, with a wealth of other research mirroring the success and diversity in the literature (e.g., Basil et al., 2013; Batchelder & Matusitz, 2014; Gharlipour et al., 2015; Muthusamy et al., 2009). While these studies show some success in using the EPPM in the health context, both in evaluating and creating fear appeals or interventions using the EPPM variables, the research also presents points for consideration when using this model in the environmental context.

3.1.1 Considerations for the use of the EPPM in the Water Security Context

3.1.1.1 Efficacy Information and Control.

The research by McKay et al. (2004) and Hatchell et al. (2013) demonstrates the necessity of including efficacy information to produce positive outcomes. The inclusion of efficacy provides individuals with a means of controlling the threats presented (Lewis, Watson, Tay, et al., 2007) and may be a vital component in contexts perceived as less controllable. Although the EPPM does not directly consider the context in which a threat is presented, evidence suggests the model can still predict behaviour, attitudes, and intentions in contexts beyond health. For example, within the road safety context, an individual has less control over others' behaviour, and positive outcomes of behavioural engagement may rely on other people's actions. For example, consider an individual who drives a maintained and road-worthy vehicle. The individual is alert, wearing a seatbelt, substance-free and following the appropriate speed limit. This person has arguably done all they can to mitigate an adverse outcome: the threat of a crash, injury, fatality or fine. However, at the same time, another driver is speeding, under the influence of an illicit substance, runs a red light and crashes into the car. This threat is unpredictable, and the outcome in this situation is therefore uncontrollable.

To a specific example of using the EPPM in a context with uncertain control, Carey and Sarma (2016) developed road safety messages using the EPPM constructs and assessed their influence on the driving behaviour of young man drivers. Results found that those exposed to only threat information had higher threat and efficacy ratings than other exposure groups but not as elevated as those exposed to both threat and efficacy information. Participants exposed to both necessary elements decreased their speed in an interactive driving measure significantly more than the control and neutral condition groups (Carey & Sarma, 2016). While considering the small sample size (n=62), the authors acknowledged a lack of power and the experimental nature of the study; this result shows some support for using all the EPPM factors to develop messages to influence behaviour in uncontrollable contexts.

Similarly, Pedruzzi et al. (2016) also examined fear appeals in road safety advertising. The study specifically investigated the influence of perceived control over road outcomes by using the two main elements of the EPPM (threat and efficacy) as the basis for enquiry through the attentional recall of risk information. Researchers investigated an individual's perceived level of control over road outcomes, which were conceptualised as risk-protective road outcomes (efficacy) versus road crash outcomes (threat), through the presentation of essays (Pedruzzi et al., 2016). One essay presented risk information about dangerous driving and crash outcomes; the other presented risk information coupled with monetary fine consequences. Participants were then given distractor tasks before being assessed on their perceived threat and control perceptions, a behavioural appraisal questionnaire and a recall task (Pedruzzi et al., 2016).

Results found that communicating threatening outcomes in a road safety message positively increased recall in both outcome types (crash vs fine). Additionally, the specified outcome must have been considered controllable by the viewer for the desired action to be performed, for example, receiving a fine and decreasing driving speed (Pedruzzi et al., 2016). This research suggests that presenting threat information alone is less effective for behaviour change, and messages should contain both the necessary action (efficacy) and fear-evoking information (threat) to achieve the balance needed to promote behavioural intention. This supports the longstanding conclusions and traditional applications of the EPPM (Witte, 1992). This result also suggests, and more importantly to the environmental context, that one's perceived control may positively influence behaviour and may be the key to overcoming avoidance responses to threat information (Pedruzzi et al., 2016). These perceptions may be particularly relevant in contexts with arguably less control at the onset.

It should be noted that perceived control and perceived efficacy are not the same. Perceived behavioural control is one's perception of their ability to perform a behaviour, which is a product of the environment surrounding the individual (Bandura, 1977; Witte, 1992). On the other hand, perceived self-efficacy captures one's own ability to perform the desired behaviour (Bandura, 1977; Witte, 1992). It is argued by some researchers that perceived self-efficacy primarily reflects internal factors influencing one's ability to perform the desired behaviours, whereas perceived behavioural control includes both internal and external factors (e.g., Parkinson et al., 2017). Whilst the EPPM only includes efficacy, the application of the model in the environmental context, specifically the water-security context, offers factors that are external to an individual and thus far have been considered in the application of the model. In the environmental context, it is reasonable to assume one's self-efficacy is influenced by external factors (i.e., the environment). While it is acknowledged that these constructs (self-efficacy and control) are different, previous research has used the terms interchangeably (e.g., Droms & Craciun, 2014). Thus, for this thesis, self-efficacy may consider the element of control in that external factors may influence it.

3.1.1.2 Individual Differences.

Another noteworthy consideration of the use of any model (including the EPPM) in an attempt to predict behaviour or behavioural intentions is individual differences. When proposing the EPPM, Witte (1992) stated that individual differences are likely to influence an individual’s threat and efficacy appraisals, potentially impacting when they engage in a fear or danger control response. Although the EPPM predicts that a high level of perceived threat and efficacy increases the likelihood that an individual will engage in the desired behaviour, the ‘optimal’ threat and efficacy levels appear to differ for individuals. Additionally, the EPPM does not consider that there may be varying levels of baseline threat and efficacy between individuals about the issue or event being communicated.

A meta-analysis by Peters et al. (2013) addressed the inconsistency of the evidence for using the EPPM and attributed it to methodological problems regarding individual differences in beliefs and attitudes. Peters et al. (2013) suggested that when an intervention is conducted with individuals with high baseline threat or efficacy perceptions, the EPPM’s predicted relationships may demonstrate promising results but will be based on designs that precluded conclusions of the threat communication’s effectiveness. Additionally, exposing an individual with an already increased threat perception to a heightened threat message may further elevate that perception and thus increase fear, potentially resulting in maladaptive behaviour, as Janis and Feshbach (1953) and Janis (1967) suggested.

There is argued to be much discrepancy over an individual’s perceived susceptibility to and severity of environmental threats (Kim et al., 2013), in that not everyone responds to events similarly. It is not surprising that individuals have diverse attitudes towards environmental issues, as such attitudes are influenced by underlying belief systems that can affect individual cognition and, therefore, engagement with environmental mitigation behaviour (Gore & Bracken, 2005). Attitudes may be further influenced by one’s previous experience with such threats and knowledge of adverse effects of the environmental threat. For example, an individual who has experienced the adverse outcomes of drought may have higher threat perceptions than someone who has not experienced these outcomes (Spence, Poortinga, Butler, et al., 2011). Additionally, factors such as personal characteristics or dispositions (e.g., personality and self-interests), the social environment (e.g., social capital, social networks), cultural factors (e.g., ethnicity or religion), exposure to information (Fishbein & Ajzen, 2010; Gifford, 2011), readiness to change (Cho & Salmon, 2006; Prochaska et al., 1983), physical context (e.g., location, climate and attachment to place; Vorkinn & Riese, 2001)), and political context (e.g., regulations and leadership responsibilities; Covello et al., 2001)) may also be influential. Therefore, individual differences in attitudes and their influence on behaviour should also be considered in the application of this model in the environmental context and are examined in chapter 6 of this thesis.

Previous research has suggested that understanding an individual's beliefs before receiving messages will result in more successful outcomes regarding behaviour change. For example, Gore and Bracken (2005) found that gathering baseline measurements of threat and efficacy variables around the dangers of meningitis could provide evidence for behaviour change. A mixed 2x2 experimental design was employed to determine if manipulated messages could further motivate individuals towards self-protective behaviours. Researchers recruited a sample of 145 college students and examined fear control and danger control responses after exposure to information on the symptoms and dangers of meningitis. Initially, participants completed a questionnaire to determine whether they currently engaged in either a fear or danger control response. Following this, participants were given either a high efficacy/no threat message or a no efficacy/high threat message to test the extreme assumptions of the EPPM. The high-threat message used vivid threatening language (e.g., *"You are susceptible to the deadly disease meningitis…"*). The high efficacy message highlighted only the recommended response of avoiding the disease and used non-threatening language explaining how to engage in this response (e.g., "*Getting a meningitis vaccination shot is easy…*") (Gore & Bracken, 2005). Immediately following the message, a post-test questionnaire was completed by participants measuring the same EPPM constructs of threat severity, threat susceptibility, response- and self-efficacy as in the pre-test questionnaire.

Results supported the main predictions of the EPPM (Witte, 1992), as exposure to the no threat information message resulted in a danger control response, and exposure to the no efficacy information message resulted in a fear control response, regardless of baseline perceptions (Gore & Bracken, 2005). See Table 2 for a more detailed but simplified description of the appraisal shifts. It seems that baseline perceptions of threat and efficacy enable a more accurate application of the EPPM, and further demonstrate the predicted relationships between the EPPM variables and their associated outcomes, as stated by Witte (1992). Additionally, this research demonstrates the model's ability to accurately predict intentions after considering perceptions of threats as they present themselves in the real world, rather than only those threats that are manipulated, hypothetical or constructed.

Table 2

Results From Gore and Bracken (2005) Study

Initial threat response	Message exposure	Resulting response
Fear control	High efficacy/No threat	Danger control
Fear control	No efficacy/High threat	Fear control
Danger control	No efficacy/High threat	Fear control
Danger control	High efficacy/No threat	Danger control

Similarly, Muthusamy et al. (2009) showed that individuals were more receptive to messages consistent with their pre-existing health values and beliefs. Additionally, and in the environmental context, Xue et al. (2016) found that messages that included high efficacy information were less effective for those who previously held moderate to strong values on eco-centrism and anthropocentrism. These findings suggest that a measurement of baseline attitudes or beliefs may be relevant for developing effective risk messages and should also be a consideration when using models such as the EPPM and evaluating the influence of a communication. This premise is examined in studies 1 and 2 of this thesis.

The diversity in individuals' attitudes concerning environmental behaviours means that alternative approaches may need to be considered when developing messages that target behaviour change (Prochaska et al., 1994). It is unreasonable to assume that all individuals exposed to a risk message or weather event are at the same baseline level of perceived threat and efficacy. The work by Peters et al. (2013) and the research conducted by Gore and Bracken (2005), Muthusamy et al. (2009) and Xue et al. (2016) demonstrate the need to consider the individual differences of the target audience when applying the EPPM in order for the manipulation of threat and efficacy variables to be successful. This allows for the adequate construction of messages that are tailored to individual belief and attitude systems, depending on an individual's original schema. Tailoring threat and efficacy constructs to suit baseline perceptions may increase message acceptability and attention, and control the negative effect of fear, potentially having positive outcomes in terms of behavioural uptake. The relationship between individual cognitive styles, EPPM variables, and environmental mitigation behaviour will be explored in greater depth in later chapters.

3.2 Water Security Context

The current research attempts to examine and predict behaviour in the water security context by using the EPPM as a basis for enquiry. To date, the EPPM has not been applied in such contexts, nor has there been an in-depth investigation into the cognitions that contribute to water-related behaviour. Other behaviour change models have been used in the water security context and may provide some considerations for using the EPPM in the current research (e.g., Dolnicar & Hurlimann, 2009; Fielding et al., 2012; Mankad et al., 2013). The remainder of this chapter will examine the literature using similar models to the EPPM for predicting behaviour in the water security context and highlight why a focus on psychological, social and cognitive predictions are imperative to not only understand perceptions of water security but also to explain behaviour in this space. The chapter will then highlight how the EPPM has been used in the general environmental context to provide a rationale for Study 1 of the current thesis.

One study that highlights the influence of previous exposure to water security issues was conducted by Dolnicar and Hurlimann (2009), who examined community attitudes towards the supply of recycled and desalinated water using the theory of planned behaviour (TPB) (Ajzen, 1985). This theory suggests that an individual's behaviour is driven by intentions which can be influenced by beliefs, social norms and perceived behavioural control (Ajzen, 1985). The research was conducted in response to the challenges of water management in urban areas of Australia, which have resulted in the increased use of alternative water sources (Dolnicar & Hurlimann, 2009). Sixty-six interviews were conducted across Australia, with respondents asked how they felt about drinking recycled/desalinated water (beliefs), who would influence their decision to drink recycled/desalinated water (social norms), the barriers to drinking recycled/desalinated water (e.g., perceived availability), and how the worsening of drought might affect willingness to drink recycled/desalinated water (perceived behavioural control) (Dolnicar & Hurlimann, 2009).

Results indicated that most individuals held positive beliefs about drinking water from alternative water sources. More optimism was shown for drinking desalinated water, with 45% of respondents indicating they had no problem drinking it, compared to only one-third of respondents indicating the same for recycled water (Dolnicar & Hurlimann, 2009). Forty-six and 38% of respondents indicated they would drink desalinated and recycled water (respectively) if it were more available, highlighting the influence perceived behavioural control had over this particular behaviour. Furthermore, 'scientists' appeared to be the primary source of influence for participants to decide whether to drink from alternative sources. Friends and family seemed to be the most influential in raising doubts and preventing participants from drinking recycled and desalinated water (Dolnicar & Hurlimann, 2009). This result suggests that social norms play a part in individual decision-making in this context.

Of most interest from this research, and a point given minimal consideration in the study by Dolnicar and Hurlimann (2009), is the impact of exposure history on individual perceptions of water-related issues and water use behaviour. Interestingly, the current supply, context and history of recycled water influenced outcomes across different locations. For example, Adelaide respondents were the most open to drinking recycled water (Dolnicar & Hurlimann, 2009). This location has an ongoing water security problem. This is similar to the city of Brisbane, which was in drought at the time, where participants stated that they would "contemplate" such actions (Dolnicar & Hurlimann, 2009). This openness to using alternative water sources may have been influenced by Adelaide and Brisbane residents having a long history of rain-water tank use due to experiencing water scarcity. These residents may, therefore, appreciate the reality of the threat to water security, potentially influencing cognition, and behaviour.

In contrast, participants located in Darwin stated they did not like the idea of drinking recycled water or that it was "disgusting" to drink water from alternative sources. Individuals from this region indicated that they had never been subject to water restrictions and sourced water from dams (Dolnicar & Hurlimann, 2009). The city's tropical location and annual wet season, which usually welcomes monsoonal rainfall periods (Bureau of Meteorology: Australian Government, 2020), may influence intentions to engage in water-saving behaviour in this region. Therefore, individual perceptions of water appear dependent upon experience and supply context. More specifically, exposure to alternative water sources or a history of water insecurity appears to positively influence individual intentions to uptake drinking from alternative sources.

A study by Fielding et al. (2012) also used the TPB as a theoretical basis to define key determinants of water conservation behaviour. The research aimed to inform more targeted water management campaigns in SEQ, Australia. Water use data were collected, and surveys containing questions developed from the variables of the TPB were administered in households in four regions of SEQ: Brisbane, Ipswich, Sunshine Coast and Gold Coast. Additionally, intentions to engage in curtailment actions, household water culture, and the installation of water-efficient infrastructure were also assessed (Fielding et al., 2012). Survey data were obtained from 1,008 homeowners across the four sites between 2009 and 2010, when the region emerged from a major drought period.

A hierarchical regression analysis predicting household water use found that demographic variables accounted for the largest proportion of variance in the model (33%). Adding psychological variables (household culture and perceived behavioural control) significantly increased the variance explained in household water use (to 35%), with household culture supporting water conservation the most important predictor. The addition of water curtailment habits also significantly increased the variance explained in household water use (to 38%), with households that engaged in more water conservation habits using less water. Last, the addition of water infrastructure variables also significantly increased the variance explained in water use (to 43%) and showed that households with plumbed rainwater tanks and water-efficient dishwashers used less water. In the final model, including all relevant variables, demographics and water conservation habits were the strongest predictors of household water conservation behaviour, suggesting that houses with fewer residents, younger occupants, and smaller incomes were the most water-smart (Fielding et al., 2012). Recognising specific and at-risk characteristics may assist in targeting particular individuals or groups for water-saving campaigns in communities experiencing threats to water security. This research also emphasises the importance of differences in psychological and demographic variables in understanding behaviour in this context. This premise will be further explored in chapters 5 and 6.

The works by Fielding et al. (2012) and Dolnicar and Hurlimann (2009) may have further benefited by using the EPPM in measuring intentions, attitudes and behaviour in their research. The lack of the EPPM's application in the water security context makes it reasonable to assume that the threat construct is not often considered in the water security context. Water, in its general sense, is not regarded as threatening. However, the supply and use of water are a threat to Australia's water security (Beeson, 2020; Gregory & Hall, 2011; Pearce et al., 2013). Therefore, considering threat perceptions in this context enables a more thorough exploration of water-related attitudes and behaviours. As stated in the aforementioned literature in the health context (Gore & Bracken, 2005; Hatchell et al., 2013; McKay et al., 2004; Roberto et al., 2019) and as also hypothesised by the EPPM (Witte, 1992), threat perception is a large driver of behaviour and is argued to have the same effect in the water security context. As the TPB does not include threat evaluations in the model, applying a model which does examine threat perceptions, such as the EPPM, may provide a more comprehensive assessment and explain more variability in behaviour in the environmental context.

Research by Mankad et al. (2013) used the protection motivation theory (PMT) to examine the role of threat perceptions in predicting intentions to install rainwater tanks in urban areas. The study was of interest because new homes were required to have an on-site water-saving device (e.g., a rainwater tank) in SEQ, Australia, and it was predicted that there would be a high reliance on these devices. Therefore, understanding why people choose to install rainwater tanks was assumed to be crucial for future water management (Mankad et al., 2013).

The study sample was recruited through an online research database. It included 460 urban residents from SEQ, Australia, aged 55 years and older, who were actively engaged in decisions about their home water supply (Mankad et al., 2013). Participants were asked to complete an online survey assessing PMT variables and intentions to install a rainwater tank on their property (Mankad et al., 2013). A regression analysis was conducted to examine the predictive power of the PMT variables on intentions to engage in adaptive behaviour. The model containing all six predictor variables was statistically significant and accounted for 43% of the variance in adaptive behaviour. Apart from social norms, all model variables made unique and significant contributions to predicting intentions, with response-efficacy being the strongest predictor (Mankad et al., 2013).

The above research highlights the unique contribution response-efficacy, response costs, threat appraisal, subjective knowledge, and subjective norms have in predicting intentions to engage in adaptive behaviour. Specifically, the research suggests that the motivational factor of response-efficacy plays a significant role in an individual’s intention to install a rainwater tank (Mankad et al., 2013), which was also highlighted earlier in the thesis as a significant variable in explaining individual response to environmental threats. Response-efficacy is particularly important in this context, given the collective action required to mitigate environmental threats (Grunig, 1976).

Further use of the PMT in the water security context is demonstrated in the research conducted by Walton and Hume (2011), who used the model to examine the Queensland Water Commission (QWC) “Target 140” campaign. In 2007, SEQ faced critically low dam levels, and household water consumption was responsible for 70% of the region's water use. Therefore, the campaign creators targeted household water users to change the water use habits of these residents, by encouraging the use of only 140 litres of water per person, per day. The campaign consisted of three key components: attitudinal change (through increasing understanding of the nature of the problem, who was using water and increasing individual efficacy), goal setting (through outlining a per-person water usage goal) and feedback (Walton & Hume, 2011).

Television commercials were the primary source for displaying this information, with images of dry catchment areas creating powerful impressions to inform viewers that despite the local green grass, the water levels in the catchment were low. Footage of water pouring from what first appears as an industrial outlet, only to find it is a kitchen tap in a typical home, created awareness that households, not businesses, were the primary water users. Commercials focused on water-saving strategies within the home, providing viewers with information on how, as individuals, they could implement meaningful changes (Walton & Hume, 2011). These advertisements were also used in other media forms, such as mail, print media, radio, online advertising, and billboards and were focused on decreasing shower times to four minutes (Walton & Hume, 2011). Information was also provided to households on their performance against the Target 140 desired outcomes, as well as feedback delivered via the household's quarterly water bill to congratulate residents on their efforts and encourage residents to try harder (Walton & Hume, 2011).

It appeared that the Target 140 campaign was successful at communicating the two key elements of the PMT: issue severity (threat), through the communications emphasising that the threat to the water supply was real for households and that household consumers were responsible for the majority of Brisbane's water use; and efficacy, through providing messages on how to respond to this threat through a simple behaviour (i.e., a four-minute shower) and regular feedback about the effectiveness of this response (Walton & Hume, 2011). Regarding behaviour, there was a 22% reduction in average daily water consumption after the campaign, leading campaign creators and the water industry to deem the Target 140 campaign a success (Walton & Hume, 2011).

Whilst the above research using the PMT showed that behaviour change was likely the result of threat and efficacy perceptions, the application of the EPPM may have enabled a further explanation of the degree or extent of the relationship between threat and efficacy and how that contributes to behavioural intentions. The EPPM offers a framework for the interrelationship between threat and efficacy variables and suggests three distinct pathways in predicting behaviour based on particular combinations of threat and efficacy perceptions, which can be argued to be advantageous over the use of the PMT in this context. Specifically in the study by Mankad et al. (2013), examining why individuals did not intend to install rainwater tanks may have assisted in constructing targeted environmental campaigns for future water management. Similarly, in the study by Walton and Hume (2011), further examining the behavioural engagement undertaken (or not) may have provided more information for future water-saving campaigns in the community. In these instances, it appears that the PMT falls short in its explanatory power. Understanding these combinations of threat and efficacy would assist in specifying the likely behavioural outcome, whether that be a danger control or fear control response. Understanding why individuals *do not* engage in environmental behaviour is essential to effectively target and encourage adaptive behaviour in the environmental context.

3.3 General Environmental Context

Whilst there has been minimal research using the EPPM in the water security context, the model has been applied in the broader environmental context, which may provide some consideration for its use in the context of focus for the current thesis. For example, a study conducted by Perrault and Clark (2018) examined the role of the EPPM constructs in predicting the performance of sustainability behaviours in college students. The research took place in an American university that was taking steps to become more environmentally sustainable. Seven hundred and seventy-nine students completed an online questionnaire that assessed participants' attitudes and motivations towards and barriers to performing sustainability behaviours (e.g., *"What would get you to adopt more sustainable practices in your life?"*). These questions were based on the EPPM constructs, including threat severity, threat susceptibility, self-efficacy, and response-efficacy. Additionally, behavioural intentions were also assessed (Perrault & Clark, 2018).

A multiple regression analysis was conducted to predict student behavioural intentions toward performing sustainability behaviours. As per the predicted pathways of the EPPM, threat variables (susceptibility and severity) were entered into the regression model first, followed by the efficacy components (self- and response-efficacy). This study found that both threat variables were significant predictors of students' intentions to perform sustainability behaviour and explained 32% of the variance in behavioural intentions. Model two, which had the addition of efficacy variables, indicated that the combination of threat severity, threat susceptibility, self-efficacy and response-efficacy significantly predicted behaviour and explained 56% of the variance in behavioural intentions (Perrault & Clark, 2018). Each component was a statistically significant positive predictor of increased behavioural intentions (Perrault & Clark, 2018).

These findings are consistent with the predictions of the EPPM and highlight the model's applicability and appropriateness in predicting pro-environmental behaviours. Interestingly, results from short answer questions indicated that participants lacked information or knowledge about sustainability behaviours. Additionally, respondents reported that sustainability behaviours were inconvenient, citing cost as a barrier to engagement (Perrault & Clark, 2018). These findings emphasise the importance of further educational information through risk messages and, more notably, the value of both self-and response-efficacy components for behavioural intention. In this context, the positive effects of engaging in environmental mitigation behaviour are not directly or immediately visible. This is particularly a concern for large global issues like climate change, where the benefit of engaging in such behaviours is often delayed (Schafer & Schlichting, 2014).

Another example of the EPPM's application in the environmental context is the research conducted by Xue et al. (2016). Xue et al. (2016) aimed to investigate the effectiveness of including efficacy information in messages to increase engagement with climate change, a consideration highlighted earlier in this thesis. This research was based on the premise that the general public were already highly fearful of environmental threats. The researchers hypothesised that increasing efficacy perceptions would lead to engagement in the danger control response, which was considered the adaptive mitigation response (Xue et al., 2016). Conducted in China, the study sample consisted of 515 individuals who completed an online survey assessing their environmental worldviews, such as ecocentrism and anthropocentrism, and engagement with the topic of climate change. Participants were then randomly assigned to one of two groups, receiving either a high or low efficacy message. The low efficacy group were given a message describing the impact of climate change on China, and the message contained no explicit efficacy information. Conversely, the high efficacy group was given the same threat information but a message that provided practical information on reducing the threat of climate change (Xue et al., 2016).

After message exposure, individuals' efficacy perceptions (self-efficacy and response-efficacy) and control responses were assessed. Danger control responses were assessed using four items that gathered participants' perceptions of the importance and value of the climate change messages and whether the messages motivated the participants to take action. Last, fear control responses were measured with three items that assessed the extent to which participants perceived the messages to be manipulative, exaggerated and encouraged denial (Xue et al., 2016).

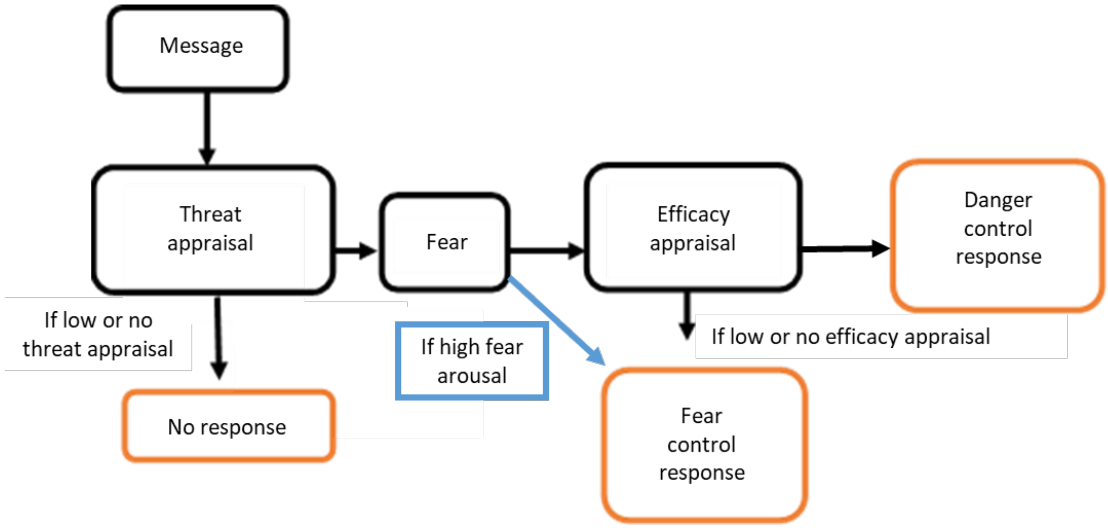
Results indicated that those presented with the high efficacy message reported an increased likelihood of engaging in a danger control response (Xue et al., 2016), as predicted by Witte (1992). As described by Xue and colleagues (2016), individuals may already have elevated threat perceptions about issues such as climate change, so providing more threat information may not be required. Instead, information about efficacy would be most appropriate. This indicates that giving people efficacy information may result in individuals engaging in the danger control process and practising environmental mitigation behaviour.

Pre-existing attitudes may also affect individual threat perceptions in the context of climate change. The research conducted by Xue et al. (2016) also suggested that messages with high efficacy information were less effective for those who initially held moderate to strong values on eco-centrism and anthropocentrism (i.e., lower levels of environmental concern) (Xue et al., 2016). This result may suggest that individuals display confirmation bias in that they are receptive to messages or communications consistent with their pre-existing values and beliefs. Additionally, the efficacy information presented may not be new or novel, and these participants may already be participating in the recommended behaviour. Furthermore, and to consider the EPPM, these individuals may not perceive any threat in this instance, thus not evaluating any efficacy information presented – i.e., no engagement in the second appraisal process of the EPPM (Witte, 1992), therefore not having a positive effect on behaviour.

According to the EPPM, a threat assessment is necessary for further engagement in the risk message. However, the theory proposed by Janis and Feshbach (1953) could also be at play in the first appraisal process in the environmental context. That is, fear emotions are elicited after threat appraisal. However, they are too high to engage in further appraisal processes, specifically those with high anthropocentric values. Figure 5 shows a visual representation of both the original EPPM (Witte, 1992) with the addition of the theory proposed by Janis and Feshbach (1953) regarding the influence of fear emotions that may assist in explaining the above result. The elements of Janis and Feshbach (1953) are outlined in blue.

Figure 5

Visual Representation of EPPM Combined With Inverted-U Theory of Fear



To examine the effect of fear in this context in more depth, the research by O'Neill and Nicholson-Cole (2009) aimed to explore the impact of fear-inducing representations of environmental issues, such as climate change, on public engagement with the issue. The researchers investigated conceptualisations of climate change in a sample of thirty people from three diverse groups; ten young mothers from a socio-disadvantaged area, ten middle-class young professionals (aged 26 to 35 years), and ten high school students (aged 16 to 17 years). Researchers assessed self-reported levels of salience and efficacy in dealing with climate change issues (O'Neill & Nicholson-Cole, 2009). Salience was defined as how important climate change issues were to the individual, while efficacy was defined as an individual’s sense of ability to do something about the issues climate change creates (O'Neill

& Nicholson-Cole, 2009). The study was conducted in three stages. The first stage involved semi-structured interviews exploring all participants' perceptions of climate change and the imagery they associated with the issue. Questions for the interviews were based on the themes of climate change imagery, personal salience, and personal efficacy. The second phase involved participants sorting images regarding the importance to the individual (salience) and whether the images increased the desire to act towards climate change (efficacy), using Q-methodology. The third phase required participants to split into focus groups to discuss and elaborate on their decisions in the previous phases (O'Neill & Nicholson-Cole, 2009).

Results for the first and third phases of the study indicated that most individuals associated mental images of climate change with events that had large-scale impacts, such as melting icebergs, rising sea level, and intense heat or droughts (O'Neill & Nicholson-Cole, 2009). In terms of individual efficacy perceptions, participants suggested that meaningful attempts at audience engagement must involve a connection with "the everyday", both spatially and temporally, to be considered important enough to engage in the behaviour. In terms of personal salience, participants felt that climate change was an important issue, however, it was not something they considered "personally" salient. This was further emphasised by participants stating that climate change was considered "distant", and if it had adverse local and personal impacts, it would be perceived as more personally concerning (O'Neill & Nicholson-Cole, 2009).

These results demonstrate that although climate change was rated as important and concerning, such events or issues are disempowering on a personal level. This raises the question of whether the provocative and powerful imagery used in behaviour mitigation campaigns actually has the desired effect in encouraging behaviour change. The use of such imagery has been suggested in health and road safety research (e.g., Algie & Rossiter, 2010;

Lewis, Watson, & Tay, 2007; Lewis, Watson, Tay, et al., 2007; Shanahan et al., 2000). However, in this context, instead of blood and gore evoking too much fear, climate change issues are perceived to be too psychologically distant to be able to control. A similar conclusion was also reached as a result of the research by Kim et al. (2013), where it was found that perceived susceptibility to climate change was not a predictor of the performance of pro-environmental behaviour because the event was deemed too large and, therefore uncontrollable by respondents. The psychological distance of environmental events will be further explored in chapter 7 of this thesis.

Results for the second phase of the study by O'Neill and Nicholson-Cole (2009) indicated that presenting images of issues people can solve or that appear controllable (i.e., solar panel installation) rather than images of problems individuals cannot do anything about (i.e., feeding starving children) assists in the engagement of efficacy perceptions. This is the same consideration proposed by Pedruzzi et al. (2016) in the road safety context, where outcomes must be perceived as controllable for the appraisal process to occur. In the environmental context, Lorenzoni and colleagues argue that individuals have already engaged in the threat appraisal process, given environmental events could be claimed to be inherently threatening to individuals due to their perceived enormity, uncertain consequences, uncontrollability and high stakes (Lorenzoni et al., 2007). It could also be that the images themselves imply threat information, for example, starving children suggesting famine. However, given threat perceptions were not explicitly measured in the study by O'Neill and Nicholson-Cole (2009), this argument about environmental threat perceptions remains an assumption. However, as hypothesised by the EPPM, providing only threat information or only efficacy information may be ineffective in terms of behavioural engagement (Witte, 1992), with this relationship appearing relevant in the study by O'Neill and Nicholson-Cole (2009).

3.4 Concluding Remarks

The necessity of effective communication in order to increase pro-environmental behaviours is ever-present. The EPPM is a robust model, as shown in multiple contexts (e.g., Basil et al., 2013; McKay et al., 2004; Perrault & Clark, 2018; Roberto et al., 2019). However, it has been minimally adapted and evaluated in the water-security context, presumably due to the complexities of communicating environmental threat information. The literature reported above shows some promising results in terms of the models use in predicting environmental behaviour, with the addition of noteworthy themes unique to the environmental context. It appears that the high and already existing threat in the environmental context and the importance of including efficacy information should be considered when applying the EPPM in this context. The lack of a comprehensive and broad application of the EPPM in the environmental context makes it difficult for policymakers, researchers, and government bodies to judge whether this model is useful in the water security context. The next chapter presents Study 1 of the current research, which aims to add to the minimal literature examining the use of the EPPM in the environmental context and explores whether the EPPM variables of perceived threat, self-efficacy and response-efficacy can predict the water conservation behaviour of residents within a region experiencing a current water security threat.

Chapter 4: Study 1a - The Assessment of the EPPM in the Water Security Context

4.1 Study Hypotheses

Study 1a adds to the minimal literature examining the use of the EPPM to predict water-related behaviours, with previous research using models such as the TPB (e.g., Dolnicar & Hurlimann, 2009; Fielding et al., 2012) and PMT (e.g., Mankad et al., 2013; Walton & Hume, 2011). This study aims to explore whether the variables of perceived threat, self-efficacy and response-efficacy can predict water conservation behaviour intentions after exposure to a real environmental threat. Based on the literature discussed, two hypotheses relating to the study aims were made. The first hypothesis was based on previous research which investigated the predictive power of threat and efficacy perceptions on environmental behaviour broadly (e.g., O'Neill & Nicholson-Cole, 2009; Perrault & Clark, 2018; Xue et al., 2016) and also behaviour in the water security context (e.g., Mankad et al., 2013; Walton & Hume, 2011). Hypothesis 1 was primarily influenced by the research conducted by Perrault and Clark (2018), who used the EPPM variables to predict pro-environmental behaviours in college students successfully. These findings are consistent with the predictions of the EPPM and highlight the model's applicability and appropriateness in predicting pro-environmental behaviours, suggesting potential success in the water-security context also.

Hypothesis 1: *It was predicted that the EPPM variables of perceived threat and efficacy (self-efficacy and response-efficacy) would predict water conservation behaviour of residents in the Townsville community.*

The second hypothesis for this study was developed as an extension of the work conducted by Perrault and Clark (2018) and by adopting the approach taken by Fielding et al. (2012), whereby the influence of demographic variables on water conservation behaviour was primarily taken into account and was the strongest predictor of water conservation behaviour.

Based on the literature discussed in chapters 2 and 3, it is predicted that threat and efficacy variables will be significant predictors over and above demographic variables in this context due to their success in predicting other environmental behaviours and behaviours in contexts that have external control considerations (i.e., the road safety context). Such variables (threat and efficacy) were not assessed in the study by Fielding et al. (2012).

Hypothesis 2: *It was predicted that the variables of the EPPM (threat, self-efficacy and response-efficacy), when examined alongside demographic variables such as age, gender, years lived in the town/city, and homeownership, would hold significant predictive power over and above demographic factors.*

Other exploratory analyses were also conducted to further understand the utility of the EPPM in the water security context. Hypotheses were not made for these analyses as they were exploratory.

4.2 Study Context

The location for Study 1a was Townsville, a city with a population of 238,813 (Australian Bureau of Statistics, 2020a), located on the northeast coast of Queensland, Australia. Although considered tropical, the city's geographical location makes it part of the dry tropics region of Queensland, resulting in less rainfall than elsewhere in the area. This region commonly experiences a six-month wet season between November and April. The region's main water supply is the Ross River Dam, initially constructed in 1970 for flood mitigation and water storage. The dam's total capacity is 250,000 mega-litres (ML) (Townsville City Council, 2022).

At the time the current study was conducted, the Townsville region had been subject to a water security threat (drought) for almost three years, starting in November 2015. The last time the city had been drought declared was in 2003. Since July 2012, the capacity level of the Ross River Dam had dramatically decreased. On the 25th of August 2015, the dam level fell below 40%, and the Townsville community were first exposed to Level 1 water restrictions. Table 3 below indicates all community water restrictions enforced by the local government (the Townsville City Council (TCC)). Level 2 restrictions were reached on October 27th 2015, when the dam dropped below 30%. The community then faced Level 3 restrictions when the dam dropped below 20% capacity on August 8th, 2016. The Ross River Dam's lowest recording was 14% capacity. If the dam had reached 10% capacity or less, Townsville would have been subject to Level 4 water restrictions. Non-compliance with restrictions resulted in on-the-spot fines of more than $350 enforced by the TCC. Hotlines were also set up to report water wastage within the community.

Table 3

Water Restriction Behaviours Enforced by the TCC During the Restriction Period

Restriction Level	Enforced restriction behaviours
Level 1	• Sprinklers only to be used between 5-7 am and 6-8 pm, two days per week • Handheld watering anytime • Bucket or water-efficient car wash to wash vehicles and boats • Pressure washers only to wash hard surfaces
Level 2	• Sprinklers only to be used between 6-8 pm, two days per week • Handheld watering anytime • Bucket or water-efficient car wash to wash vehicles and boats • Washing of hard surfaces is not permitted
Level 3	• Sprinklers are not used • Handheld watering between 6-7 am and 6-7 pm, two days per week (this also includes weeper hoses) • Water-efficient car wash only to wash vehicles and boats • Washing of hard surfaces is not permitted
Level 4	• No sprinklers or handheld watering allowed • Watering cans and buckets only, two days per week

The Haughton pipeline was used during the restriction period to carry water from the Burdekin Dam to the Ross River Dam (Haughton Channel) to maintain Townsville's water usage and supply. The Haughton pipeline was first constructed in the 1980s to provide backup water supplies to the Ross River and Paluma Dams to meet Townsville city's daily supplies during drought. From the 16th of November 2016 until the 15th of January 2017, and from the 12th of November 2017 until the 28th of February 2018, water was pumped from the Burdekin Dam to the Ross River Dam. This was the first time in 10 years the pipeline had been used. Approximately 130 ML per day was pumped to the Ross River Dam, which was approximately 30kms from the Haughton Channel of the Burdekin Dam. This practice cost the TCC $35,000 on average per day to operate. A new pipeline funded by the Queensland government, costing $225 million, is currently being constructed and was proposed to be completed at the end of 2019. As of July 2022, the pipeline is still not near completion. In addition to the pipeline funding, the Queensland government also provided $10 million for water education programs for the region.

There were four main issues of interest within the region during the restriction period discussed above. These issues were the community's low levels of water conservation behaviour and the inability to accurately measure water conservation behaviour in the region, reliance on short-term solutions by governing bodies, inadequate communication strategies, and the arguably differing levels of concern by residents about the water crisis. During the drought in the Townsville region, the community had to adapt to water restrictions to conserve the city's water supply. At the time, the only direct measure of community water conservation behaviour compliance was the dam level measurements, which provided an inaccurate measurement in terms of community water usage. An example of the graphs used to show such measurements is presented in Figure 6. The image of the daily numerical value in mega-litres, as shown in Figure 7, was often printed in the local newspaper (*Townsville Bulletin*).

Figure 6

TCC Website Dam Level Image (Townsville City Council, 2021)

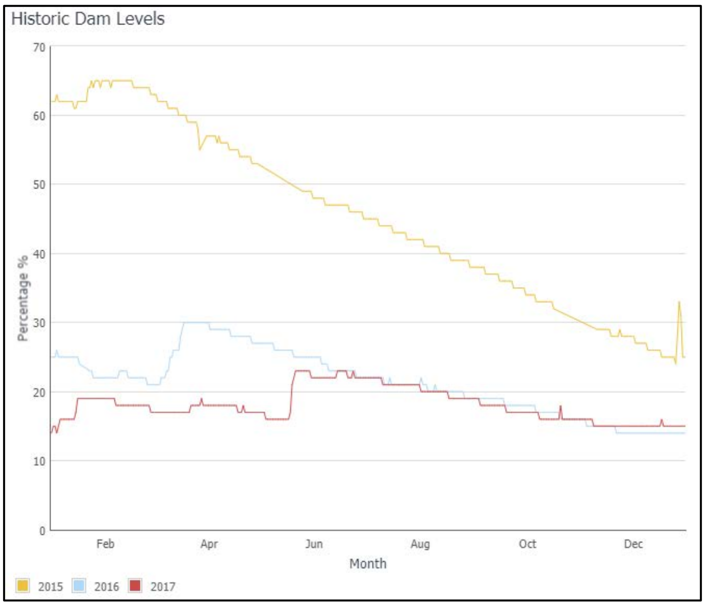
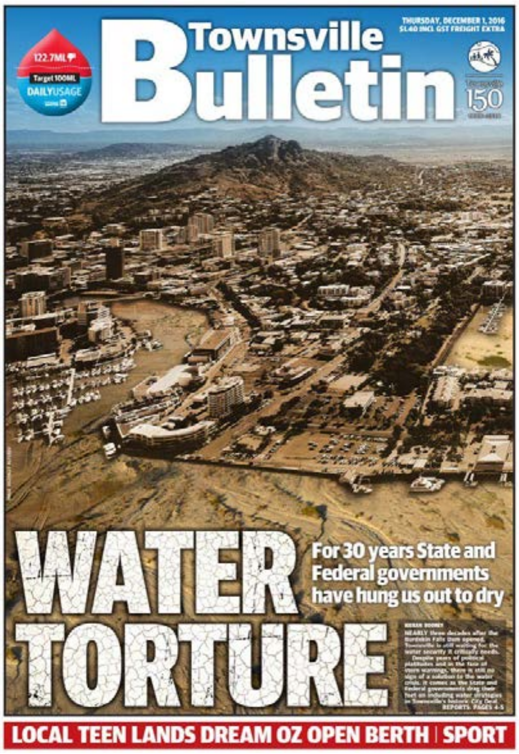


Figure 7

Example of Townsville Bulletin Front Cover During Drought Period



122.7ML

Target 100ML

DAILY USAGE

Townsville Bulletin

THURSDAY, DECEMBER 1, 2016

150

WATER TORTURE

For 30 years State and Federal governments have hung us out to dry

LOCAL TEEN LANDS DREAM OZ OPEN BERTH | SPORT

Note. Refer to the top left corner. Townsville Bulletin front page December 1st [Newspaper]. (2016). Retrieved from Twitter. URL (https://twitter.com/bennyglish/status/804040984292007936) in the public domain.

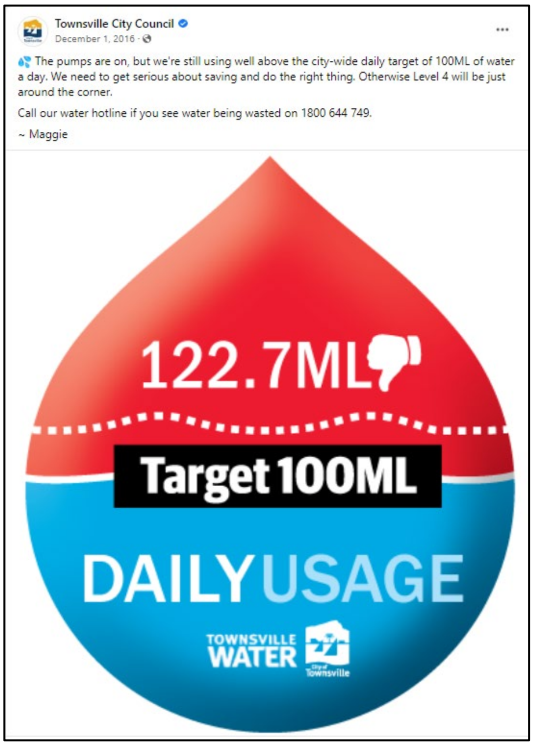
The second issue is the proposed pipeline itself, which provided a short-term solution to the water issue in the community. Both state and local governing bodies largely backed the pipeline solution at the time. Although necessary given the geographical location of Townsville, the pipeline has cost governing bodies millions of dollars. Given the location of Townsville and the weather being unreliable in maintaining the dam's water supply, it is argued that effective water conservation behaviour within the community should be practiced at all times, regardless of the presence of a pipeline. The importance of maintaining the behaviour over time would arguably be more effective than periodically introducing behaviour change when a drought occurs. The fact that the pipeline is deemed the 'solution' to such issues may have inhibited water-saving behaviour, as some individuals may have thought such behaviour was not required because the pipeline would increase water supply.

The third issue is the communication of the water problem within the Townsville region. Like most water-saving campaigns, the campaigns within the Townsville community were created in response to the onset of drought. While there have been past water-saving initiatives and communications within the Townsville community, only one published evaluation (conference paper) of a TCC water-saving initiative was found. This evaluation was on the TCC Dry Tropics Water Smart initiative, developed by the TCC Integrated Sustainability Services and Townsville Water, and was informed by The University of Adelaide's Entrepreneurship, Commercialisation and Innovation Centre (Manning et al., 2013). This water-saving initiative comprised of two strategies. The first strategy proposed was to establish communications to promote the benefits of reducing outdoor water use and present a simple watering regime that residents could adopt. The second strategy involved trialing water-efficient technology (i.e., water-saving hose fittings) through a 'hose-swap' activity (Manning et al., 2013). The evaluation found that Townsville residents had variable strategy uptake, with some strategies engendering an enthusiastic community response and others less so. The authors suggested that campaign success may rely upon the characteristics and preferences of the target community. It was concluded that water savings would only be made if the product or action being promoted has been shown to have a tangible impact on reducing water use, for example, adjusting water schedules to match weather conditions, compared to adding organic matter to the soil to improve moisture (Manning et al., 2013).

More recently, during the drought period in question for this study, there was significant coverage of the issue in all local news outlets. Although an attempt was made, it could be argued that there was a high emphasis on threat information (see Figure 8 for an example of a Facebook post by the TCC). Additionally, each communication attempt came with phrases that centred around the pipeline being the solution to the water security issue in the region (e.g., Townsville City Council, 2017). Again, this approach gave leverage to a temporary solution instead of focusing on ways to change behaviour to improve long-term water security.

Figure 8

Facebook Post by TCC (December 1st 2016)



Note: Image text reads: *"The pumps are on, but we're still using well above the city-wide daily target of 100ML of water a day. We need to get serious about saving and do the right thing. Otherwise Level 4 will be just around the corner"*.

The conclusions by Manning et al. (2013) and the assessment of current initiatives highlight the complex nature of communicating behaviour change strategies to mitigate environmental threats. Additionally, the research presented in previous chapters highlights the variability of individual perceptions of and responses to such information (Gore & Bracken, 2005; Kim et al., 2013; Schafer & Schlichting, 2014; Syme et al., 2000; Xue et al., 2016). As such, due to the arguably ineffective communication strategies to encourage water conservation behaviour and given the drought was still current in the area at the time of the study, Townsville was an appropriate setting to continue exploring environmental threat perceptions and responses to provide recommendations for future risk communication.

Last, water itself is complex to conceptualise. Water is so easily obtained and quickly disposed of in developed societies that residents may not consider its use, storage, and disposal (Pearce et al., 2013). Additionally, what it means to be water-secure, and how to achieve water security have also not been established in the literature (e.g., Brears (2017), Gerlak et al. (2018) and Allan et al. (2021)). Before the drought in Townsville, those living in the region may have been unconcerned about their water usage. However, as a water supply is threatened by extreme events, such as when it is scarce in a drought, more attention may be paid to its use, storage, and disposal. The United Nations General Assembly states that all humans have the right to water United Nations Department of Economic and Social Affairs (UNDESA) (n.d.). Yet, in a drought period, this “right” became monitored and controlled for Townsville residents. Additionally, a significant focus of the water-saving campaigns was on household usage, which carried monetary penalties for overuse or misuse (Townsville City Council, 2016). In this instance, how water is perceived may significantly impact how one uses water. For example, one could take a firm stance on the human right to have access to safe water for life versus accepting the seriousness and collective action required to mitigate further drought effects in the region. This perception of water may also be mediated by attachment to the region itself and location (e.g., whether you own the home you live in) (Dolnicar & Hurlimann, 2009; Vorkinn & Riese, 2001). Given there was no current measurement of individual water-related behaviour, no recent evaluation of initiatives or water-saving strategies and given the region was experiencing a current water-related event that can be considered ‘threatening’, it was fitting to test whether the variables within the EPPM could assist in the explanation of water conservation behaviour in an at-risk region, such as Townsville, in response to a real-world event.

4.3 Method

4.3.1 Study Design

Study 1a was a descriptive cross-sectional study. Participants were asked to complete an online survey assessing threat and efficacy perceptions regarding the drought period in their local community and engagement with water conservation behaviour, among other measures further described below

4.3.2 Participants

Participants were 445 individuals recruited from the Townsville region in North Queensland, Australia. Participants' data were only included in the final analysis if they had completed at least forty percent of the questionnaire and indicated that they "*Agreed*" to participate. Additionally, participants needed to complete at least half of the questions that contributed to each variable of interest (threat, self-efficacy, and response-efficacy) to be included in the final analysis. On this basis, 82 respondents were excluded from the analysis, and the total sample consisted of 363 participants(118 men, 243 women and two individuals who did not indicate their gender), ranging in age from 17 to 78 years (M= 42.57, SD= 15.77). A total of 256 participants (70%) indicated they were homeowners. The average time of residency in Townsville was 19.10 years (SD= 15.11).

4.3.3 Materials

A 115-item survey was developed for this study. The full version of the survey can be found in Appendix A. Questions were based on the EPPM variables (threat, self-efficacy, and response-efficacy) and current water usage behaviours. Additionally, questions regarding perceived negative impact, behavioural barriers, water restriction knowledge, responsibility, attitudes, and satisfaction with media coverage were also included in the survey. The survey took approximately 15 minutes to complete.

4.3.4 Measures

Demographics. Demographic data were collected, including gender, age, homeownership status, and length of residency in Townsville.

Threat. Threat was defined as the existence of an external stimulus perceived as danger or harm to an individual. For this study, the threat construct was primarily concerned with the perceived severity of the risk, given drought was a current event in the Townsville region and questions were developed in consultation with the research team based on how threat perceptions are defined within the EPPM (Witte, 1992) Participants were asked to rate their agreement with seven items on a 5-point Likert Scale (e.g., 1= *strongly disagree* to 5= *strongly agree*). Questions such as *"I am more concerned regarding Townsville's water supply than I was six months ago"* were used to assess participants' threat perception. Scores on relevant questions were summed and averaged to give each participant a total threat perception score, ranging between one and five, as per the original response scale. Higher scores indicated higher levels of threat perception. The Cronbach alpha value of this measure was .75, suggesting acceptable reliability.

Self-efficacy. Self-efficacy was defined as whether an individual perceived they could take action to minimise a perceived threat (Witte, 1992). For this measure, questions were worded to reflect collective efficacy in that an individual perceives that their personal action can contribute to the collective, that is, the Townsville community. These questions were developed in consultation with the research team based on how efficacy perceptions are defined within the EPPM (Witte, 1992). Participants were asked to rate their agreement with four items on a 5-point Likert Scale (1= *strongly disagree* to 5= *strongly agree*). Questions such as *"I have the knowledge to be able to adjust my behaviour to help minimise the water issue in the Townsville region"* were used to assess an individual's perceived self-efficacy. One question was negatively worded and was reverse coded prior to the analysis. Scores on the relevant questions were summed and averaged to give each participant a total perceived self-efficacy score, with scores ranging between one and five, as per the original response scale. Higher scores indicated higher levels of perceived self-efficacy. The Cronbach alpha value of this measure was .70, suggesting acceptable reliability.

Response-efficacy. Response efficacy was defined as whether an individual perceived that the action they take to minimise a perceived threat is effective (Witte, 1992). For this measure, questions were worded to reflect collective efficacy in that an individual perceives that their personal action can contribute to the collective (the Townsville community). These questions were developed in consultation with the research team based on how response-efficacy is defined within the EPPM (Witte, 1992). Participants were asked to rate their agreement with two items on a 5-point Likert Scale (1= *strongly disagree* to 5= *strongly agree*). Questions such as *"I do not think saving water will make a substantial positive difference for the city of Townsville"* were used to assess an individual's perceived response-efficacy. One question was negatively worded and was reverse coded prior to the analysis. Scores on the relevant questions were summed and averaged to give each participant a total perceived response-efficacy score, with scores ranging between one and five, as per the original response scale. Higher scores indicated higher levels of perceived response-efficacy. The Cronbach alpha value of this measure was .67, slightly below acceptable levels of reliability.

Water Conservation Behaviour. Participants' water conservation behaviours were also assessed. Participants were asked to indicate the frequency they performed each of the 18 water-related behaviours on a 5-point Likert Scale (1= *never* to 5= *always*). Questions such as *"In the past year, have water restrictions caused you to stop using sprinkler and irrigation systems?"* were used to assess an individual's water conservation behaviour and compliance. Four items were reverse coded to align with frequency measures before conducting the analysis. Each participant was given a total water conservation behaviour score by summing the item scores, ranging between 18 and 90. Higher scores indicated a higher frequency of water conservation behaviour. The Cronbach alpha value of this measure was .80, suggesting acceptable levels of reliability.

Of the above 18 questions, four questions directly relating to the TCC's enforced behaviours for Level 3 water restrictions were included in the behaviour measure. These questions were added to examine whether behavioural compliance was limited to behaviours that were part of the local government-enforced water restrictions. Scores on these four questions were added together to give a total TCC behaviour score with a possible range between four and 20 for each participant. Higher scores indicated higher levels of compliance with TCC enforced behaviours. The Cronbach alpha value of this measure was .58, suggesting a low level of reliability.

Furthermore, the remaining behaviours from the total behaviour measure (14 questions) were added together to give a separate behaviour score (which had removed the TCC enforced behaviours). This was referred to as non-TCC enforced behaviours. Scores had a possible range between 14 and 70 for each participant. Higher scores indicated higher levels of compliance with behaviours that were not TCC enforced. The Cronbach alpha value of this measure was .75, suggesting an acceptable level of reliability.

Environmental Attitudes. Attitudes were assessed using the New Ecological Paradigm (NEP; (Dunlap et al., 2000)). The NEP is designed to measure the generalised attitudes of individuals about the nature of human-environment interactions. Participants were asked to rate their agreement with 15 items on a 5-point Likert Scale (1 = *strongly disagree* to 5 = *strongly agree*). Questions such as *"If things continue on their present course, we will experience a major environmental catastrophe"* were used to measure individual attitudes. All even-numbered items (seven items) were reverse coded. Scores were added together to form a total environmental attitude score for each participant, with scores ranging between 15 and 75. Higher scores indicated higher levels of pro-environmental attitudes. The NEP has shown predictive validity with moderate and moderately high correlations between NEP scores and support for pro-environmental policies (r= 0.57), perceived seriousness of world ecological problems (r= 0.61), seriousness of state and community air and water pollution (r= 0.45) and also pro-environmental behaviour (r= 0.31; (Searle & Gow, 2010)). The Cronbach alpha value of this measure was .92, suggesting a high level of reliability.

Negative Impact of Drought. These questions assessed participants' perceptions of the negative impact of the water issue on themselves, their family, Townsville, and the environment. Participants were asked to rate the negative impact the water issue had with four questions on a 5-point Likert Scale (1 = *no negative impact* to 5 = *extreme negative impact*), with higher scores indicating higher levels of perceived negative impact. Questions such as "*Please indicate the level of negative impact you believe Townsville's current diminishing water supply has on you personally"* were used. These items also made up the broader threat variable. The negative impact measure separated the threat construct to examine further how participants perceived the drought in greater depth regarding the impact on the individual personally and bodies external to the individual. No analyses were conducted between threat and negative impact measures. Scores for each negative impact variable (individual, family and friends, Townsville, and the environment) ranged between one and five, as per the original response scale. The Cronbach alpha value of this measure was .82, suggesting an acceptable level of reliability.

Responsibility to Engage/for Action. These questions assessed how much responsibility the participant perceived they personally, the community, the TCC and the state government had for solving Townsville's water supply issue. Participants were asked to rate their perceived responsibility with four questions on a 5-point Likert Scale (1 = *not at all responsible* to 5 = *completely responsible*), with higher scores indicating higher levels of perceived responsibility. Questions such as *"Please indicate the level of responsibility you think the Townsville City Council has for solving the current water supply issue"* were used. Scores for each perceived responsibility level (individual, community, TCC and state government) ranged between one and five, as per the original response scale. The Cronbach alpha value of this measure was .58, suggesting a low level of reliability.

Barriers to Behaviour. Barriers to performing water conservation behaviours were also assessed. These items were generated by the research team and were based on common barriers raised in local discourse, collected expertise of the region's culture and experience with water insecurity, as well as consultation with members of the general public. Participants were asked to rate agreement with 17 questions on a 5-point Likert Scale (1 = *strongly disagree* to 5 = *strongly agree*). Questions such as *"I do not have enough time to engage in water-saving behaviours"* were used. Three questions were negatively worded and were reverse coded prior to the analysis. Scores were summed to give each participant a total barrier score, ranging between 17 and 85. Higher scores indicated more perceived behavioural barriers to engaging in water conservation behaviours. Some barrier measures were also used to form the efficacy variables mentioned above (i.e., "*I do not have confidence in my ability or capacity to engage in water saving behaviour", "I have the knowledge to be able to adjust my behaviour to help minimise the water issue in the Townsville region", "I know what I can do to help minimise the water issue in the Townsville region", "I have access to the tools and assistance I need to help minimise the water issue in the Townsville region"* and, *"I do not think saving water will make a substantial positive difference for the city of Townsville"*). The Cronbach alpha value of this measure was .56, suggesting a low level of reliability. Divergent validity was also present with behavioural barriers negatively correlating with TCC behaviour (*r* = -.21, *p* < .05) and non-TCC behaviour (*r* = -.47, *p* < .01) No analyses were conducted between barriers and efficacy variables.

Satisfaction with Quality and Amount of Media Information. Two questions also assessed participants' satisfaction with the amount and quality of information distributed in the media about water restrictions within Townsville. Participants were asked to rate their satisfaction with media quality and amount on a 5-point Likert Scale (1 = *extremely dissatisfied* to 5 = *extremely satisfied*). Questions such as *"How satisfied are you with the quality of information you have been given regarding the water restrictions in the Townsville region"* and "*How satisfied are you with the amount of information you have been given regarding the water restrictions in the Townsville region"*, were used to measure individual satisfaction with the quality and amount of media information. Higher scores indicated higher satisfaction with the quality and amount of information. Scores for each question ranged between one and five, as per the original response scale.

Water Restriction Knowledge. Participants were assessed on their knowledge of specific TCC Level 3 water restrictions. Ten behaviours were listed, and participants were asked to select all behaviours in the list that they believed were required under the current water restrictions generated from the TCC website at the time. Questions such as *"Hand-held watering only (between certain hours)"* were used to assess individual knowledge of water restrictions. Five out of the ten behaviours were part of the water restrictions.

4.3.5 Procedure

Ethical approval was obtained through the James Cook University Ethics committee (Ethics approval H7118) (see Appendix B). Recruitment sites included online social media networks (Twitter and Facebook) and University and community networks via local radio stations. Interested participants were presented with a URL where they could find and complete the survey on the Qualtrics (Provo, UT) online platform. All participants read an information sheet and indicated their consent to participate in the study (see Appendix C for the information sheet). Active consent was obtained by participants agreeing to participate in the questionnaire by clicking "*AGREE*". Upon completing the survey, the participants were thanked for their time and awarded course credit where applicable. Non-university students did not receive compensation for their participation in the study. The survey was active from the 27th of September 2017 until the 20th of February 2018.

4.3.6 Data Treatment and Analysis

The data were downloaded from the Qualtrics (Provo, UT) platform, and all data management and statistical analyses were performed using IBM SPSS Version 23. General descriptive analyses were conducted on all variables of interest. Correlation analyses were conducted to explore the relationships between all demographic, EPPM and behaviour measures. Independent sample *t*-tests were conducted to examine differences between homeownership and, all water conservation behaviours (total behaviour, TCC enforced behaviour, and non-TCC enforced behaviour), and the EPPM variables (threat, self-efficacy, and response-efficacy). The same analyses were also conducted for gender. Last, a hierarchical multiple regression analysis was conducted to examine if the factors within the EPPM (threat, self-efficacy, and response-efficacy) and demographics variables were predictors of water conservation behaviour in line with the EPPM predictive framework. Part and partial correlations were also calculated to determine the strength of the relationships between relevant variables.

4.4 Results

4.4.1 Sample Characteristics

Table 4 includes the means and standard deviations of the variables measured. On the variables of the EPPM, the sample had mid to high ratings of threat, self-efficacy, and response-efficacy. On average, participants scored mid-range on the frequency of total water conservation behaviours, TCC enforced, and non-TCC enforced behaviours. Participants in the sample also scored mid to high range for pro-environmental attitudes. The sample had mid-range ratings of the water issue negatively impacting themselves and their family and friends and higher perceived ratings of negative impacts on the city of Townsville and the environment. There were low ratings for perceived responsibility belonging to the individual and the community. The participants also indicated the TCC and the state government were more responsible for securing the water supply, on average. Participants also, on average, reported mid-range scores for satisfaction with the amount and the quality of information shared in the media regarding the water issue within Townsville.

Table 4

Means (SD) for the Total Sample on all Variables

Variable	Mean (*SD*)
Threat	3.69 (0.72)
Self-efficacy	3.70 (0.71)
Response-efficacy	3.06 (1.12)
Behaviour (total)	54.12 (13.63)
TCC enforced behaviour	13.61 (4.90)
Non-TCC enforced behaviour	40.51 (10.37)
Attitudes	47.58 (8.43)
Negative impact (Individual)	3.10 (1.14)
Negative impact (Family and friends)	3.10 (1.07)
Negative impact (Townsville)	3.89 (0.93)
Negative impact (Environment)	3.96 (1.04)
Responsibility (Individual)	2.37 (1.13)
Responsibility (Community)	2.58 (1.21)
Responsibility (Local Gov.)	4.21 (0.82)
Responsibility (State Gov.)	4.27 (0.88)
Barriers	43.88 (10.03)
Satisfaction with media (Amount)	3.14 (1.03)
Satisfaction with media (Quality)	3.04 (0.97)

Table 5 represents the percentage of the sample that indicated which behaviour belonged to the TCC enforced behaviours at the time of Level 3 water restrictions within the Townsville Community. As shown in the table, for each of the five questions included in the measure that were TCC enforced behaviours, 70% or more of the sample correctly identified these behaviours. Fifty-one percent of participants indicated the five correct TCC enforced behaviours as well as other non-TCC enforced behaviours, with 13% selecting *only* the five TCC enforced behaviours. Furthermore, out of the 363 participants, 335 (92%) selected Townsville was in Level 3 water restrictions (the correct response when the survey was active).

Table 5

Percentage of the Total Sample That Correctly Indicated Level 3 Water Restriction Behaviour

	Behaviour	Percentage (%)
TCC enforced Behaviour	No sprinkler or irrigation system	87.30
	Hand-held watering only (between certain hours)	92.00
	No automatic watering systems	82.10
	The use of a broom to clean hard surfaces (not a hose)	70.50
	The use of a bucket to wash or clean vehicles	78.00
Non-TCC enforced Behaviour	Showers for no longer than five minutes	14.90
	The use of buckets, watering cans and drop irrigation systems at any time	49.00
	No dish-washing machines	1.10
	The use of a bucket for washing animals	17.60
	Sprinklers can be used at any time	1.90

On average, the sample reported mid-range scores for barriers to engaging in water conservation behaviour. Of particular note are the 80.2% of the sample who thought water-saving was important and 74.6% and 70.8% who acknowledged they have the knowledge to adjust their behaviour and know what they can do to help minimise the issue within the region, respectively. Last, 68.6% of the sample believed other people did not follow the restrictions, 71.4% wanted their yard and lawn to look nice, and 4.7% did not believe the Townsville region was in drought. Refer to Appendix D, where Table 27 shows the reported percentages of agreement with the behaviour barrier statements for the total sample.

Table 6 presents the Pearson correlation coefficients between the EPPM variables and all types of water conservation behaviour. Significant low to moderate positive correlations were found between the EPPM variables of threat, self-efficacy, response-efficacy, and total water conservation behaviour, TCC enforced behaviour, and non-TCC enforced behaviour. This result indicates that higher levels of threat, self-efficacy and response-efficacy are associated with higher levels of water conservation behaviour. A significant weak positive correlation was also found between self-efficacy and response efficacy, indicating that higher levels of self-efficacy tended to be associated with higher levels of response-efficacy. No significant correlations were found between self-efficacy or response efficacy and threat. A moderate positive correlation was also found between TCC enforced behaviour and non-TCC enforced behaviour, indicating that higher levels of water conservation behaviours that the TCC did not enforce are associated with higher levels of compliance with TCC enforced water conservation behaviours.

Age and length of residency were also correlated with the variables of interest. Significant weak positive correlations were found between age and TCC behaviour, and non-TCC enforced behaviour. All results indicated that the higher the age of the participants, the higher the reported frequency of water conservation behaviour. Significant weak positive correlations were also found between age and threat and self-efficacy perceptions. This result indicated that the higher the participant’s age, the higher the reported frequency of participant's threat and self-efficacy perceptions. There was no significant relationship between age and response-efficacy. Significant weak positive correlations were found between the length of residency in Townsville (in years), and TCC enforced behaviour, and non-TCC enforced behaviour. On all accounts, an increase in time lived in Townsville was associated with an increase in the reported frequency of water conservation behaviour. A significant weak positive correlation was found between length of residency in Townsville (in years) and threat perceptions. This result indicated that as the length of residency increased, so did the threat perceptions of participants. A negative relationship was found between the length of residency and response-efficacy perceptions. Here, as the reported length of time lived in Townsville increased, response-efficacy perceptions of participants decreased. No significant relationship was found between length of residence and self-efficacy perceptions of participants.

A significant moderate negative correlation was found between behavioural barriers and non-TCC enforced water conservation behaviours, as well as TCC enforced behaviour and barriers. These results indicated that those who performed water conservation behaviour simultaneously perceived fewer barriers to engaging in said behaviour. Since attitude has no relationship with any outcome variables (behaviour, threat, self-efficacy, and response-efficacy), attitude measures were not used in further analyses.

Table 6

Correlations Between EPPM, Demographic Variables and Water Conservation Behaviour

	Threat	Self-Efficacy	Response -Efficacy	TCC behaviour	Non-TCC behaviour
Self-efficacy	.08				
Response-efficacy	-.02	.22**			
TCC behaviour	.26**	.18**	.18**		
Non-TCC behaviour	.25**	.25**	.38**	.53**	
Age	.19**	.19**	-.08	.19**	.16**
Length of residency	.14**	.09	-.12*	.13*	.12*
Total Barriers	-.00			-.21*	-.47**
Total Attitude	-.01	.04	.00	-.05	.03

Note. *p < .05. **p t < .01

Table 7 shows the correlation coefficients between all outcome variables and variables assessing negative impact, responsibility, and media impact for the total sample. There were significant weak positive correlations between non-TCC water conservation behaviour and all negative impact variables, as well as TCC enforced behaviour and all negative impact variables. These results indicated higher levels of perceived negative impact on the individual, family and friends, Townsville, and the environment were associated with higher water conservation behaviour compliance. Response-efficacy also had significant weak negative correlations with perceived negative impact on the individual and family and friends. This finding suggested that response-efficacy perceptions increased as the perceptions of negative impact on the individual and family and friends decreased.

Individual and public responsibility had a significant weak correlation with non-TCC enforced water conservation behaviour. The same relationship was also found between individual responsibility and TCC behaviour compliance. These findings suggested that higher levels of these responsibility variables were associated with higher levels of water conservation behaviour. Response-efficacy also had a significant moderate positive correlation with individual and public responsibility, indicating higher levels of these perceived responsibility variables were associated with higher levels of response-efficacy. Last, participant threat perceptions had significant weak to moderate positive correlations with TCC and state government responsibility (respectively), indicating that increased responsibility perceptions for both levels of government were associated with increased threat perceptions.

The quality and amount of information given by the media had a significant moderate positive relationship with response-efficacy. This same relationship was also present with self-efficacy and both media variables. These results indicated that higher perceived levels of quality and amount of media information were associated with higher perceived response- and self-efficacy levels.

Table 7

Correlation Values for the Total Sample Between EPPM and Other Variables of Interest

	Non-TCC Behaviour	TCC Behaviour	Response-Efficacy	Self-Efficacy	Threat
Negative Impact					
Individual	.15**	.18**	-.15**	-.02	
Family and friends	.11*	.14**	-.15**	-.04	
Townsville City	.13*	.14**	-.07	.04	
Environment	.21**	.21**	.05	.05	
Responsibility					
Individual	.23**	.13*	.35**	.02	-.01
Public	.17**	.05	.36**	-.06	-.06
TCC	.05	.02	-.05	-.02	.25**
State Gov.	.04	.06	-.07	.05	.34**
Media					
Quality	.03	.10	.19**	.24**	-.05
Amount	.03	.09	.13*	.26**	-.05

Note. *p < .05. **p < .01

Independent samples *t*-tests were also performed to examine the impact of demographic variables on water conservation behaviour. Before conducting each *t*-test, the relevant assumptions were assessed. There were no significant outliers, and the assumptions of homogeneity and normality were all satisfied. First, an independent sample *t*-test was conducted to examine for differences between men and women on all water conservation behaviour types. Refer to Table 8 for all relevant statistics. Results found significant differences between men and women on non- TCC enforced behaviour and on TCC enforced behaviour. On all accounts, women performed more water conservation behaviour than men in this sample. These same analyses were also conducted to examine differences between participant gender on all EPPM variables (threat, self-efficacy, and response efficacy). A significant difference was found between men and women on threat perceptions, with women reporting higher threat perceptions than men. No significant differences were found between gender on self-efficacy or response-efficacy perceptions for the sample.

Table 8

Independent T-Test Between Behaviour and EPPM Variable Scores on Participant Gender

	Men	Women	$t_{(df)}$
	M (SD)		
Non TCC-enforced behaviour	37.67 (10.78)	41.85 (9.91)	$-3.65_{(359)}$**
TCC-enforced behaviour	12.36 (5.32)	14.17 (4.57)	$-3.17_{(203.50)}$**
Threat	3.52 (0.82)	3.76 (0.66)	$-2.79_{(192.28)}$**
Self-efficacy	3.70 (0.74)	3.70 (0.69)	$-0.00_{(359)}$
Response-efficacy	2.93 (1.13)	3.13 (1.10)	$-1.59_{(359)}$

Note. ***p* < .01

Next, independent samples *t*-tests were conducted to examine differences between homeownership status and all water conservation behaviour types. Refer to Table 9 for all relevant statistics. Results found a significant difference between total water conservation behaviour based on homeownership status. Participants who owned their homes indicated a greater level of total water conservation behaviour compared to those who did not own their home. There were no significant differences in non-TCC enforced behaviour and TCC enforced behaviour based on homeownership status. The same analyses were also conducted between homeownership status and the EPPM variables (threat, self-efficacy, and response-efficacy). A significant difference was found between those who owned a home and those who did not on threat perceptions and self-efficacy perceptions. For threat and self-efficacy perceptions, homeowners reported higher perceptions. There was also a significant difference in response-efficacy perceptions between participants who owned a home and those who did not. In this instance, those who did not own a home had higher response-efficacy perceptions.

Table 9

Independent T-Test Between Behaviour and EPPM Variable Scores on Participant Homeownership Status

	Owned home	Did not own home	$t_{(df)}$
	M (SD)		
Behaviour (total)	55.06 (13.60)	51.90 (12.31)	$2.02_{(359)}$*
Non TCC-enforced behaviour	41.56 (10.56)	38.99 (9.64)	$1.81_{(359)}$
TCC-enforced behaviour	13.90 (4.74)	12.90 (5.18)	$1.77_{(359)}$
Threat	3.76 (0.74)	3.49 (0.64)	$3.42_{(220.08)}$**
Self-efficacy	3.79 (0.71)	3.48 (0.68)	$3.84_{(359)}$**
Response-efficacy	2.95 (1.18)	3.28 (0.92)	$-2.79_{(245.14)}$**

Note. *p <.05; **p <.01

4.4.2 Testing the EPPM

A hierarchical multiple regression analysis was conducted to examine if the factors within the EPPM (threat, self-efficacy, and response-efficacy) were predictors of total water conservation behaviour in line with the EPPM predictive framework. The demographic variables of gender, age, years lived in Townsville, and homeownership were entered into the model first. Variables were entered in this order to explore the predictive power of the EPPM over and above demographic characteristics of individuals. The threat variable was entered into the regression model in the second block, given the EPPM hypothesises that threat appraisals must occur before further cognitive processing of a message. Efficacy components (self-and response-efficacy) were then added to determine if the overall predictability of behaviour could be improved.

Prior to this analysis, the relevant assumptions of this statistical test were analysed. First, as illustrated above, there were no high correlations between the independent variables, and the Durbin Watson value was less than two (1.8). All collinearity statistics (VIF and tolerance) were within acceptable limits (<10 and >.20, respectively). Therefore, the assumption of non-multicollinearity was met. Inspection of residual and scatter plots also indicated the assumptions of normality, linearity and homoscedasticity were all satisfied. Results of the hierarchical multiple regression analysis are presented in Table 10 and indicate that the demographic variables accounted for a significant 8.4% of the variance in total water conservation behaviour in Stage 1 ($F_{(4,322)}$= 8.50, $p < .01$). Gender and age were significant predictors of water conservation behaviour, with part correlations suggesting that gender explained 5.11% of the unique variance. Neither years lived in Townsville, nor homeownership were significant predictors of water conservation behaviour. The addition of the threat variable in Stage 2 added a significant 6% of variance to the prediction of total water conservation behaviour ($F_{(5,321)}$= 11.81, $p < .01$). In this model, gender, age, and threat were significant predictors of water conservation behaviour, with threat explaining 6% of the unique variance. The addition of the efficacy variables (self-and response-efficacy) in Stage 3 added a significant 14.6% of variance to the prediction of water conservation behaviour ($F_{(7,319)}$= 19.62, $p < .01$). The final model accounted for 28.6% of the variance in total water conservation behaviour. With all independent variables included, it was found that the EPPM variables of threat, self-efficacy and response-efficacy were all significant predictors of total water conservation behaviour, over and above demographic variables, with each variable explaining 5.52%, 1.42% and 10.24% of the unique variance in the final model, respectively. Age and gender remained significant predictors of water conservation behaviour in the final model. Refer to Appendix E for SPSS output.

Table 10

Predicting Water Conservation Behaviour in Line With EPPM Hypotheses

	B (SE)	β	95% CI	sr^2	t
Stage 1 (Constant)	33.47 (5.33)		[22.99-43.95]		6.28**
Years lived in Townsville	0.05 (0.06)	0.06	[-0.06-0.16]	< .01	0.94
Gender	6.53 (1.53)	0.23	[3.52-9.54]	.05	4.27**
Age	0.18 (0.06)	0.21	[0.05-0.31]	.02	2.79**
Homeownership	0.92 (2.06)	0.03	[-3.13-4.97]	< .01	0.45
Stage 2 (Constant)	18.81 (6.01)		[7.00-30.63]		3.13**
Years lived in Townsville	0.04 (0.05)	0.04	[-0.07-0.14]	< .01	0.70
Gender	5.27 (1.50)	0.18	[2.31-8.23]	.03	3.51**
Age	0.15 (0.06)	0.18	[0.03-0.27]	.02	2.42*
Homeownership	1.39 (1.20)	0.05	[-2.53-5.32]	< .01	0.70
Threat	4.84 (1.02)	0.25	[2.84-6.83]	.06	4.77**
Stage 3 (Constant)	1.26 (6.37)		[-11.27-13.79]		0.20
Years lived in Townsville	0.78 (0.05)	0.09	[-0.02-0.17]	< .01	1.59
Gender	4.40 (1.38)	0.15	[1.69-7.10]	.02	3.19**
Age	0.11 (0.06)	1.33	[0.00-0.23]	< .01	2.00*
Homeownership	0.69 (1.84)	0.02	[-2.93-4.32]	< .01	0.38
Threat	4.64 (0.92)	0.24	[2.82-6.47]	.05	5.01**
Self-efficacy	4.06 (0.60)	0.34	[0.54-4.28]	.01	6.83**
Response-efficacy	2.41 (0.95)	0.13	[2.89-5.23]	.10	2.54*

Note. **p* < .05. ***p* < .01

4.5 Discussion

4.5.1 Overview of Key Findings

Study 1a aimed to add to the minimal literature examining the use of the EPPM in the environmental context and explore whether the EPPM variables were able to predict water conservation behaviour. In line with the EPPM's predictions, hypothesis one for the current study predicted that the EPPM variables of perceived threat and efficacy (self-efficacy and response-efficacy) would predict the water conservation behaviour of residents in the Townsville community who were experiencing a current threat to their water supply (drought).

The current study found that the higher an individual's perceived threat, self-efficacy, and response-efficacy, the greater the compliance with water conservation behaviour. This result aligns with and extends upon previous research using the EPPM to predict other environmental behaviour intentions (Li, 2014; Perrault & Clark, 2018; Xue et al., 2016), and also supports the original EPPM predictions (Witte, 1992) and the first proposed hypothesis of this study. To the researcher's knowledge, this is the first study that has used this model to predict behaviour in response to a real-world environmental threat in the water security context, rather than behavioural intentions. This methodology also extends on the research by Dolnicar and Hurlimann (2009) and Mankad et al. (2013), who used the PMT as a theoretical approach to explore perceptions of water-related events.

Hypothesis two of the current study predicted that the variables of the EPPM (threat, self-efficacy and response-efficacy), when examined alongside demographic variables such as age, gender, years lived in the town/city, and homeownership, would hold significant predictive power over and above demographic factors. Results showed a significant relationship between all EPPM variables and behaviour, even after controlling for the demographic variables of age, gender, years lived in Townsville and homeownership. This finding contrasts with the study by Fielding et al. (2012), who found that demographic variables predicted the largest proportion of variance in household water use.

Although it has been suggested that factors such as individual differences (Gore & Bracken, 2005; Peters et al., 2013; Xue et al., 2016) and psychological distance (Kim et al., 2013; O'Neill & Nicholson-Cole, 2009; Scannell & Gifford, 2013; Spence & Pidgeon, 2010) may make predicting environmental behaviour challenging, it was evident that the EPPM can successfully predict water conservation behaviour in this context. For the current study, one possible explanation for the results is that the environmental threat of decreased water availability for the Townsville community was a present threat to the region when the survey was distributed and somewhat ‘personal’ to those who participated in the study. Previous research on environmental threats has predominately focused on global threats and used broad terms such as “climate change” (e.g., O'Neill & Nicholson-Cole, 2009; Perrault & Clark, 2018; Xue et al., 2016). Previous literature has also stated that the environmental events that are more personally salient or localised are more concerning and empowering (Kim et al., 2013; O'Neill & Nicholson-Cole, 2009). Although the current research was not a ‘personal’ threat, such as seen in health literature, a ‘local’ threat may be considered more relevant and salient to an individual, leading to increased perceptions of threat, self-efficacy and response-efficacy of the issue. These increased perceptions resulted in increased environmental behaviour for this sample. This may also explain why even after controlling for demographic factors, the EPPM variables were able to predict behaviour.

Despite participants only reporting, on average, mid-range scores for response efficacy, the unique contribution of variance that response-efficacy provides to the overall model predicting water conservation is of interest. In the water security context, it appears that stronger perceptions of behaviours or actions that would reduce or mitigate the water security issue in the region are predictive of greater water conservation behaviour. This premise is also part of a core component of the EPPM predictions – the second appraisal process in engaging in adaptive behaviour (Witte, 1992). The result in the current study reflects the research in the broad environmental context and especially the water security context, where efficacy perceptions were found to be significant contributors to behaviour, attitudes and intentions (e.g., Li, 2014; Mankad et al., 2013; Perrault & Clark, 2018; Xue et al., 2016). Specifically, this finding aligns with the research by Mankad et al. (2013), who suggested that the factor of response-efficacy plays a significant role in an individual's intention to install a rainwater tank. Response-efficacy, therefore, may play a considerable role in predicting behaviour in the water-security context, and thus it is suggested that communication in the water security context should focus on this factor.

The demographic variables of gender and age also held predictive power for water conservation behaviour. There were significant differences between men and women on reported water conservation behaviour, with women indicating a higher frequency of behaviour on all accounts. This result contrasts with the findings by Mankad et al. (2013), where differences in gender were found for social norms and protective factors however, not for behaviour. There was also a relationship between age and water conservation behaviour, in that the older a participant was, the more likely they would engage in these actions. In addition, both gender and age were significant predictors of behaviour in the regression analyses. This result contradicts findings by Fielding et al. (2012), where younger individuals were more likely to engage in water-related behaviours. For the sample in the current study, it may be that older individuals are more likely to engage in water conservation behaviour, given they may have more experience with such water concerns and issues in the region. This group may also be more aware of what may assist in mitigating the present threat in the community. It should be noted that whilst these demographic and EPPM variables were predictive of behaviour, there was a considerable portion of unexplained variance in behaviour for this sample. This is explored further in upcoming chapters, where such variables and their relationships with water conservation behaviour are further examined.

Regarding the model itself, a finding of interest is the non-significant relationship between the efficacy variables (self-and response-efficacy) and threat. The EPPM emphasises the relationship between threat and efficacy (Witte, 1992) and how this relationship predicts behaviour. Within the EPPM, exposure to risk messages first elicits threat perceptions. If efficacy perceptions are then engaged, this is hypothesised to result in one of three behavioural responses (i.e., no response, fear-control response or danger-control response) (Witte, 1992). The relationship between threat, efficacy and outcome is hypothesised to be additive, with high/low threat perceptions not necessarily related to high/low efficacy perceptions. Instead, threat and efficacy are said to have predictive power over outcomes, regardless of how they are related (Witte, 1992; Witte & Allen, 2000). By finding the non-significant relationship between threat and efficacy, but both variables being predictive of behaviour, the current study's results align with the EPPM's predicted variable inter-relationships (Witte, 1992).

4.5.2 Other Findings of Interest

What should be considered is that water restrictions were enforced within the community at the time of the survey. It could be assumed that individuals only engaged in water-saving behaviour because they were enforced by the local council and had a monetary penalty for non-compliance. Additionally, the questions used in the survey were worded in terms of '*compliance since water restrictions*'. To explore this further and to investigate the potential effect of contextual confounding factors, a correlation was performed between non-TCC enforced water conservation behaviours and the TCC enforced behaviours. Results found a moderate positive relationship between the two sets of behaviours, indicating an increase in one set of behaviours is associated with an increase in the other. Therefore, monetary penalty or enforcement can be presumed to have impacted *any* type of water conservation behaviour within the community as those who participate in TCC enforced behaviour also appear to be participating in other water conservation behaviour, suggesting imposing such restrictions may have flow-on effects for the greater environment. Future research could explore the motivations behind water-saving behaviour to further examine this finding.

In terms of communication attempts to encourage water conservation behaviour, participants were moderately satisfied with both the amount and quality of information about the water crisis within the region. It was also found that increased satisfaction with both the amount and quality of media information increased an individual's perceived self- and response-efficacy. The current communications provided information about how to mitigate the water security issue, this being water restrictions in the local community. Individuals who saw the communications may have had stronger beliefs that they could engage in actions to directly and effectively control the issue. Participants were also quite knowledgeable about the specific behaviours of Level 3 water restrictions within the Townsville region, potentially suggesting that current communications about these behaviours were successful. In terms of effective communication, and as suggested by O'Neill and Nicholson-Cole (2009) and Kim et al. (2013), localised and personally salient events were more concerning (i.e., increasing threat perceptions) and empowering (i.e., increasing efficacy perceptions), therefore were more likely to increase behavioural engagement to mitigate such threats.

In addition, and as expected, there was a significant positive relationship between self- and response-efficacy perceptions. In this context, water restrictions may have influenced self-efficacy perceptions at the time of the survey - individuals were given instructions about specific actions they could take to conserve water through media channels and letter-box drops. The behaviours suggested by governing bodies were relatively easy to do (i.e., do not hose driveways), so they may have felt they could engage in them quite effortlessly. The same consideration would also apply to response-efficacy. Here it can also be assumed that because a governing body has given the public the information and potentially fines those who are non-compliant, individuals would presume the behaviours that are being advised are effective in minimising the water threat. Thus, individuals knew what behaviours to engage in and were convinced these were effective in mitigating the threat to water security. This again potentially highlights the success of current communication attempts in the region. This is opposed to communication attempts to mitigate global threats, such as climate change, which often have no clear, obvious, or specific action to reduce such threats. This result emphasises the importance of effective communication strategies, notably the EPPM variables, given their relationship with behaviour compliance.

Furthermore, regarding behaviour, a negative relationship was found between water conservation behaviours and barriers to engaging in water conservation behaviour. This finding was expected given the long-standing research regarding the negative relationship between such constructs (e.g., Rogers (1983)). Considering the strong negative relationship between behaviour and barriers found in this study, communications about the restrictions could focus on minimising the perceived barriers to these behaviours to obtain even greater compliance with water conservation behaviour. For example, 47.4% of participants agreed with the statement regarding the lack of financial incentives for participating in water-saving behaviour. Future water-saving communications could therefore focus on the money homeowners save on their annual household rates if they reduce their water consumption.

Another finding of interest is centred on the sample's perceived responsibility for solving the water security issue. The residents of Townsville perceived both the TCC and state government to be the most responsible for solving the water crisis within the community, with considerably lower scores reported for responsibility belonging to the individual and community. This attitude presents a problem for current behaviour change communication attempting to encourage individual water-conservation behaviour, as individuals do not perceive they are responsible for solving the issues and may not act to conserve water. Additionally, high levels of individual and community responsibility were associated with high levels of water conservation behaviour and response-efficacy, and lower levels of perceived behavioural barriers. These factors were related to increased behaviour, therefore, communications may need to focus more on convincing the individual to feel more responsible for solving the issue. For example, messages could highlight the key roles individuals play in water-saving in the region by showing the collective effects of water conservation behaviour. For example, if one person waters their garden more efficiently versus if the entire street engaged in this behaviour, with the latter more effective in terms of water-saving. Although the sample has indicated that these governing bodies are primarily responsible for solving Townsville's water supply issue, the sample may not perceive these bodies as doing enoughURL or the necessary actions to minimise the water issue. Additionally, given the promise of the pipeline by these bodies (that was not delivered), this may also indicate a mistrust with these figures. This result may also indicate the lack of control this sample has over that issue, which may support the mid-range response-efficacy perceptions of the sample. It seems that effort needs to be made to convince this population that they too are partly responsible for resolving the community's water supply problem.

Last, for other findings of interest, no relationship was found between environmental attitudes and the EPPM variables (threat, self-efficacy, and response-efficacy) or behaviour, despite the high ratings of environmental attitudes indicated by the sample overall. This outcome was unexpected, given that beliefs may provide the basis for attitudes, leading to intention and action (Fishbein & Ajzen, 2010). However, as stated by Gore and Bracken (2005), in the environmental context, audiences have diverse opinions and attitudes towards environmental issues influenced by underlying belief systems, affecting individual cognition and, therefore, engagement with environmental mitigation behaviour. The attitude measure used in this study assessed an individual's beliefs about pro-environmental positions (Dunlap et al., 2000), while other measures used in the study were specific to water security in a particular context (i.e., Townsville). It seems that general environmental attitudes (e.g., on the broad issue of climate change) are not influential to perceptions of a current and specific environmental threat (e.g., a current drought), highlighting the contextual relevance communications must entail to encourage behaviour change in an at-risk community.

It appears that broader attitudes toward the environment do not reflect specific water-saving behaviour or attitudes. The behaviour measure in this study assesses behaviours of individuals in a region experiencing drought, with monetary fines for non-compliance. Thus, the measurement of belief systems may not be synonymous with the behaviours and the context influencing such behaviours at the time. In addition, the context may also explain the lack of relationship between the EPPM variables and attitudes.

4.5.3 Implications

The current study has various theoretical and practical implications in the water security context. First, the findings suggest that the EPPM is an appropriate model for predicting behaviour in the water-security context. Additionally, the model could predict behaviour in response to a real-world threat (drought) currently being experienced by the sample of interest, thus showing its utility beyond studies providing a message about fabricated events. These findings suggest that it would be beneficial for risk communication in this context to be focused on the factors of threat, self-efficacy, and response-efficacy, given the positive relationships these variables had with water-conservation behaviour. More specifically, in terms of the model's variables, it seems that efficacy, predominately that of response-efficacy, plays a considerable role in predicting behaviour. Thus, communications regarding water-saving should focus on the inclusion of information that explains why certain behaviour is essential for conserving the community's water supply. Whilst the findings were encouraging, there was a considerable portion of unexplained variance in predicting behaviour for this sample. Therefore, the following chapters and relevant studies aim to further examine this gap that the model could not explain. Further practical and theoretical implications of these findings are discussed in chapter 9.

4.5.4 Limitations

The main limitations of this work are the self-reported nature of behaviour and potential sampling bias. The water issue within the Townsville region could be considered a sensitive topic, with local government enforced behaviour that results in monetary penalties for non-compliance. It would be reasonable to assume that participants in the study may have biased reporting regarding their water conservation behaviour compliance because of these factors. As the issue is also politically sensitive, it could be assumed that certain community groups or individuals may have responded to push an 'agenda'. For example, participant alignment with a certain political party may have influenced their responses to questions around water conservation, with some political parties more vocal about this issue than others. For example, as shown in this media release from the Townsville Labor party in 2018, who was focused on managing the water security issue in the region at the time (URL: https://www.jasonclare.com.au/media/portfolio-media-releases/4126-labor-will-deliver-once-and-for-all-water-security-for-townsville). Additionally, those who care about environmental issues in general, may be more likely to participate in such research, potentially creating sampling bias. A large and diverse community sample was recruited to counteract this effect, and responses were anonymous.

Additionally, there are some limitations concerning the threat variable. In this study, threat was not broken into severity and susceptibility components, as the original EPPM suggests, potentially undermining the true predictive power of the individual threat variables.

At the time, given all participants in Townsville were experiencing and thus susceptible to the drought in the region, threat susceptibility was not a major point of consideration for the research. Given that water perceptions are arguably complex, the current study focused on evaluating and measuring specific threats in their broadest nature. Future studies in the current thesis using this variable endeavour to split this variable into its two sub-categories, as the model suggests.

Additionally, there was also a limitation regarding the reliability of some of the measures used for this study, for example, the assessment of behavioural barriers. These measures were thought to show face validity by reflecting the specific circumstances around water security faced by the community at the time of the study. These measures were constructed via consultation between the research team and community members on potential barriers that may have influenced their water conservation behaviour. As the full psychometric testing of these measures was outside the scope of this thesis, future research could explore further validation of these measures for wider use within this context.

4.6 Concluding Remarks

The current study attempted to address the gap in the literature regarding the use of the EPPM in predicting the frequency of water conservation behaviour. This research demonstrates a successful application of the EPPM to predict water conservation behaviours with threat, self-efficacy and response-efficacy being significantly predictive of water-conservation behaviour, over and above demographic factors. These results allow researchers to understand the threat and efficacy perceptions of the population of interest in the water security context more thoroughly. Whilst the EPPM variables of threat and efficacy predicted water conservation behaviour whilst controlling for demographic variables, there was a considerable portion of unexplained variance in behaviour. Thus, while these findings are encouraging, much is left to be explored. As water security threats are likely in the future, establishing the basis for effective communication to promote water-saving behaviours is imperative. The current research provides the necessary information to conduct research using the EPPM in the water security context and potentially formulate communication strategies based on the variables of interest. The next chapter will examine the effect individual differences have on behaviour.

Chapter 5: Attention to Environmental Messages and Audience Segmentation

Given the complexity of an individual's perception of environmental threats, as addressed in previous chapters, it is unreasonable to assume individuals process and react to events (specifically relating to the environment) in the same manner. Consequently, and as Witte (1992) suggests, individuals will engage in different behavioural outcomes based on their perceptions. Differing perceptions of an issue present a significant challenge to policymakers, advertisers and the like to develop effective strategies to influence behavioural uptake. This is particularly pertinent within the water security context.

The results in chapter 4 provide evidence for using and applying the EPPM to predict water conservation behaviour. Although the model outlines an arguably unambiguous framework for behavioural prediction, there are several additional considerations about the relationship between threat and efficacy and their ability to predict behaviour when applied in the environmental context. To put simply, the EPPM predicts that a high level of threat and efficacy is required for fear appeals to succeed in behavioural engagement. The analysis in Study 1a, although showing that threat and efficacy variables are predictive of behaviour, cannot account for the intricacies between the inter-variable relationships, for example, too much threat can hinder adaptive behaviour (Janis, 1967; Janis & Feshbach, 1953), as well as individual differences that may affect perceptions of threat and efficacy (Gore & Bracken, 2005; Xue et al., 2016). To extend on the findings of Study 1a and investigate the effect individual differences have on water conservation behaviour and the workings of the inter-variable relationships, the EPPM framework will be used to cluster people into groups based on common perceptions of the variables within the model (threat and efficacy).

If the approach is successful, this may produce recommendations for targeted environmental threat communications to sub-groups of a population whose interpretations of such events are highly variable. It may also provide a better understanding of why individuals may or may not engage in environmental behaviour. To address this, audience segmentation, a social marketing technique, may assist in controlling for some of the variation within a community by grouping like perceptions and providing a more in-depth understanding of environmental threat responses. This technique is explored further below.

5.1 Audience Segmentation

Audience segmentation, first coined by Smith (1956), is the process of identifying like groups within a population to improve the effectiveness of public engagement campaigns (Maibach et al., 2011). The result of this process (like-minded groups) are consumers who share common needs, characteristics or behaviours and are hypothesised to respond similarly when exposed to marketing activities (Grier & Kumanyika, 2010). Since its inception in the early 1970s and particularly now in the age of technology and social media, audience segmentation has become one of the primary strategies employed to further understand population differences due to its effectiveness, efficiency and affordability (Hine et al., 2014). The increase in use of audience segmentation strategies leads to the discussion of ‘social marketing’. Social marketing has borrowed concepts and methods from traditional marketing with the aim of increasing engagement with ‘nontangible’ products (Lefebvre & Flora, 1988). Overall, social marketing aims to influence the uptake of the desired behaviour within a population, for example, conservation or sustainability behaviours, through four main objectives: influencing behaviour, applying marketing principles and techniques, focusing on target audience clusters and delivering a positive benefit for society (Kotler & Lee, 2008). Simply put, this approach attempts to understand what appeals to individuals by dividing the market into smaller, more targeted groups (Kotler & Lee, 2008).

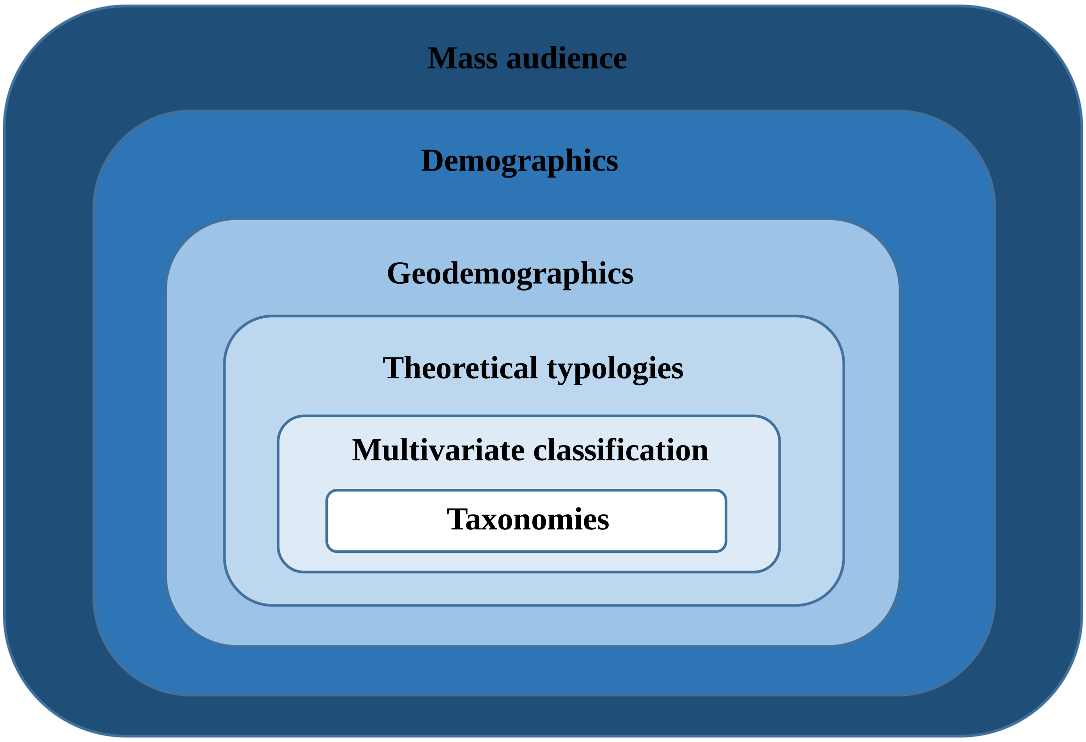
Social marketing has positively impacted social issues in the contexts of health, the environment, injury prevention, financial well-being, and community involvement, with audience segmentation being a prominent strategy in all settings (e.g., Aaker et al., 2000; Abu

Bakar et al., 2021; Grier & Kumanyika, 2010; Hine et al., 2014; Kotler & Lee, 2008; Lavack et al., 2008; Lefebvre & Flora, 1988; Rimal et al., 2009). Research has demonstrated that if consumers are communicated to in a way that resonates with their beliefs, values and attitudes and the communication is more personally meaningful, they are more likely to respond favourably to such strategies (Aaker et al., 2000). This same conclusion has also been shown in environmental behaviour research (Kim et al., 2013; O'Neill & Nicholson-Cole, 2009).

The variables used to construct ‘clusters’ within an audience vary. These can be based on geographic location (e.g., country, town), demographics (e.g., gender, age, family makeup, race, occupation, socio-economic status), social structure (e.g., workplace, church, legislative bodies), consumer behaviour (e.g., product use) and psychographics (e.g., personality characteristics, identified need, level of readiness to change), with the idea that each segment is homogenous (Grier & Kumanyika, 2010; Lefebvre & Flora, 1988). This means that the status of the variables of interest is more similar *within* each cluster group than the status *between* cluster groups. As Grunig (1989) determined, segmentation strategies become more specific relative to the size of the group being analysed. For example, a larger group has less specific segmenting variables. A visual representation is shown in Figure 9, developed by Slater (1996). As the boxes or populations get smaller, the predictors of the behaviour or attitude in question become more specific. This thesis focuses on the more inner or defined areas of segmentation. These include *Theoretical typologies*, which are homogenous clusters based on variables theoretically linked to the target issue or behaviour, and *Multivariate classifications*, which are homogenous clusters based on distinctive patterns or relationships between attitude or behaviour determinants (e.g., groups based on the various relationships between threat and efficacy resulting in different behavioural outcomes, according to the EPPM) (Slater, 1996).

Figure 9

Segmentation Levels (Slater, 1996)



Once clusters are constructed, actions used to reach and target each subgroup usually involve either tailoring a message or communication to meet cluster preferences or needs, distribution of a message in settings used by clusters (e.g., churches or communities), or promoting the message through channels known to targeted clusters (e.g., schools or neighbourhoods)(Grier & Kumanyika, 2010). The application of audience segmentation allows for further exploration into the many determinants of behaviour. It permits the method of social marketing to advance with increased societal challenges, such as adverse climate conditions, policy changes and health-related threats, by targeting (more meaningfully) smaller and alike groups.

When targeting entire populations, it came with the realisation that traditional health interventions were not as effective in producing behaviour change within a large cohort (Lefebvre & Flora, 1988). As such, health interventions have since used audience segmentation in campaigns to, for example, reduce alcohol use, increase occupational health and safety, and decrease sexually transmitted diseases (Dijkstra & De Vries, 2000; Mathijssen et al., 2012; Rimal et al., 2009). As previously stated by Gore and Bracken (2005), for health interventions to be effective, an evaluation of a person's threat and efficacy perceptions towards a particular health risk needs to be conducted first. By doing so, it is hypothesised to eliminate the risk of presenting someone with a pre-existing fear control response with more threat information, making it more likely for them to engage in a maladaptive or fear-control response (Witte, 1992). This view is further supported in the research conducted by Xue et al. (2016) in the environmental context. Here it was stated that gathering baseline measurements of participant perceptions would be useful prior to viewing a fear appeal (Xue et al., 2016). Furthermore, the research by Dean et al. (2019) suggested that targeted strategies would enhance communication on sustainable coastal management, and Fielding et al. (2012) also called for targeted approaches to curb water usage. Given this suggestion has been made in the environmental context, it is worth investigating the audience segmentation approach more closely. The use of audience segmentation in the health and environmental context is demonstrated below by exploring its use in behaviour and attitude change interventions.

5.2 Behaviour Change Strategies and Audience Segmentation

Audience segmentation has been used predominantly in the health context. For example, the study by Mathijssen et al. (2012) segmented a sample of adolescents based on their alcohol use and attitudes. The attitudinal variables were aversion to intoxication, alcohol as a norm, need for approval, hedonistic associations, and lack of interest in alcohol. It was found that each of the five resulting clusters differed in drinking behaviour independent of demographic factors and had significantly different patterns of each attitudinal variable (Mathijssen et al., 2012). Similarly, Boslaugh et al. (2005) compared the results of audience segmentation techniques for physical activity promotion. The researchers conducted segmentation based on demographic variables, health status and psychosocial variables alone and when all three variable types were combined (Boslaugh et al., 2005). Results found that combining all three variable types produced the most homogenous clusters or internally similar groups regarding physical activity (Boslaugh et al., 2005).

These research examples demonstrate the ability to construct audience clusters in the health context, whether based on demographic (Boslaugh et al., 2005) or attitudinal factors (Mathijssen et al., 2012). Other health research has demonstrated even more simplistic segmentation approaches, such as the study conducted by Silk and Parrott (2006), where researchers measured baseline behaviour to develop messages to increase sun-safety related behaviour engagement. For example, those in the first out of the three resulting clusters wore baseball hats, exposing their neck to sunlight but minimally engaged in other sun-safety-related behaviour. Therefore researchers suggested that messages targeted to this particular cluster should reinforce wearing hats that maximise sun protection, as knowledge about sun protection behaviour is related to engagement with the behaviour (Silk & Parrott, 2006). In contrast, the second group were engaged in all types of sun-related behaviour. Therefore, researchers suggested that targeted communications should be based on encouraging and maintaining behaviour (Silk & Parrott, 2006). Although considered successful in terms of developing population clusters, this simplistic approach does not address the determinants and barriers of behaviour between individuals or the cognitive factors that play a role in individual behaviour engagement.

Campaigns constructed based on audience segmentation methods have often used socio-demographic characteristics, such as age, gender, and ethnicity, to segment the audience into smaller, more homogenous groups (Slater, 1995). The argument for using socio-demographic variables as the segmentation method is based on complex causal relationships. For example, shared cultural factors are assumed to equate to everyday life experiences resulting in similar motivations and situational constraints which affect an individual's behaviour (Slater, 1995). Although these campaigns may be considered adequate when factors of race and age significantly influence the target behaviour, this method may not always produce meaningful clusters in terms of behaviour change in particular contexts (Campo et al., 2012). For example, research conducted by Boslaugh et al. (2005) demonstrated that simple segmentation techniques, such as those that only use demographic variables, do not capture the diverse nature of the target audience.

It has been suggested that the variables used to segment audiences should be based on their relationship to the target behaviour and have a theoretical basis. It has also been recommended by Slater (1995) that clusters should be homogenous with respect to the interaction of variables that determine the behaviour targeted by the communication (e.g., similar levels of both threat and efficacy when considering the EPPM (Witte, 1992)). Defining the determinants of behaviour and like-patterns between variable interactions are argued to be useful in constructing more tailored communications (Slater, 1996). With that said, audience segmentation in the health context has also taken a theoretical approach to segment construction.

In the study conducted by Silk et al. (2005), researchers used the theory of reasoned action (Ajzen, 1985, 1991; Fishbein & Ajzen, 1975) to segment audiences based on their attitudes and subjective norms related to genetically modified food. Rimal et al. (2009) also employed this theoretical approach in their research seeking to alter HIV-related behaviours in Malawi. The study successfully applied the risk perception attitude framework (Rimal & Real, 2003) to segment the participants into meaningful and homogenous groups. This research heavily emphasised using a theoretical approach to design interventions that promote the rejection of risk behaviour or adoption of protective behaviour. The theoretical approach was considered more effective in predicting antecedents than traditional segmentation methods based on demographic variables (Rimal et al., 2009).

More pertinent to the current research, the EPPM (Witte, 1992) has also been shown to segment audiences effectively. The success of the use of this model is unsurprising given the variables within the model have been used extensively to predict behaviour in health (Gore & Bracken, 2005; McKay et al., 2004; Schneider et al., 2012), road safety (Carey & Sarma, 2016; Pedruzzi et al., 2016), and environmental contexts (Hart & Feldman, 2014; Perrault & Clark, 2018; Xue et al., 2016). Campo et al. (2012) used the EPPM variables to segment women based on their perceptions of unintended pregnancy and contraception usage. Researchers found that unintended pregnancy occurs in approximately one in ten women, often resulting in negative consequences (Finer & Henshaw, 2006). The assumption that this group of individuals (women) is homogenous is likely to indicate why such interventions have had little success. Researchers proposed that audience segmentation techniques targeting more homogenous groups of women would produce more effective social marking interventions for contraceptive usage (Campo et al., 2012). A telephone survey was administered to women between the ages of 18 to 30 years, with a total of 401 respondents answering questions assessing knowledge, attitudes, behaviour related to reproductive health for women and the EPPM variables (self-efficacy, response-efficacy, perceived threat severity and fear) (Campo et al., 2012).

A *k*-means cluster analysis was conducted with a four-cluster result selected. Individuals within cluster 1 indicated the least fear, with cluster 2 indicating the most. Cluster 3 had the lowest perceived susceptibility, and cluster 1 the highest. Self-efficacy was the highest, and response-efficacy was the lowest in cluster 4 (Campo et al., 2012). Between-group exploratory analyses were conducted to provide more detailed information on how intervention messages could and should be tailored to encourage safe sex practices. For example, individuals in cluster 4 were noted as a priority audience for a campaign to improve contraceptive use and prevent unintended pregnancy. This cluster was the youngest, had the smallest percentage of married individuals and women with children, the lowest normative perceptions about their married woman friends' contraception use, the lowest percentage of contraception use themselves and the highest percentage of unintended pregnancies (Campo et al., 2012). It was suggested that this group would benefit from messages that increased susceptibility, given their extensive experience with unintended pregnancies had not appeared to impact their threat perceptions. These messages were also suggested to be coupled with response-efficacy and self-efficacy components. Without the efficacy components, this group would likely experience increased fear and maladaptive behaviours because of the reported low levels of response efficacy and self-efficacy perceptions (Campo et al., 2012). This research suggests success for the use of the EPPM as a theoretical basis to construct meaningful clusters within a population. Furthermore, it was shown that the EPPM variables were able to meaningfully distinguish groups based on factors relevant to the target behaviour.

Segmenting based on like cognitions provides information pertaining to group behaviour and suggests the key attributes communication strategies may require to shift such behaviour. After clustering based on theoretical standings, performing exploratory analyses on each group provides further unique information relevant to each cluster group, as shown in the research by Campo et al. (2012). Further, similar demographic variables, location and political ideologies may be present within cluster groups. Analysing demographic information offers a more comprehensive description of generated clusters and, therefore, may assist in developing appropriate and effective communication strategies targeting particular audiences.

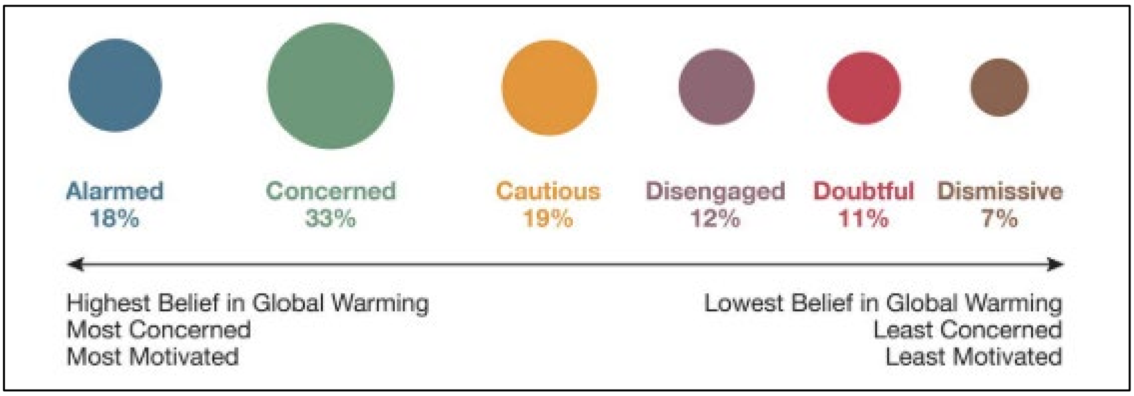
5.2.1 Audience Segmentation in the Environmental Context

Overall, the above research demonstrates the effectiveness of using behaviour change models, such as the EPPM, in segmenting audiences in the health context. The results encourage the use of constructs beyond demographic variables to develop audience clusters to provide a more in-depth description of the target population to inform behaviour change communications. However, more relevant to the current research is the use of audience segmentation techniques in the environmental context, which is considered a relatively new approach. For example, Maibach et al. (2011) used the process of audience segmentation within an adult American population to improve the effectiveness of public engagement campaigns on global warming. A sample of 2,164 American adults were recruited and completed a survey that measured global warming beliefs, behaviour policy preference, and issue engagement. Six groups were produced that differed based on segmentation variables, with the largest cluster representing 33% of the total sample and the smallest representing 7% (Maibach et al., 2011).

Clusters were named and defined based on differences in their profiling information (demographics, beliefs and behaviours). These were labelled "Alarmed", "Concerned", "Cautious", "Disengaged", "Doubtful", and "Dismissive" (Maibach et al., 2011). See Figure 10, which visually represents each cluster's relative size, global warming beliefs, concerns and motivation to change.

Figure 10

Cluster Global Warming Beliefs, Concern and Motivation (Maibach et al., 2011)



The Alarmed were the most engaged with global warming and were already making lifestyle changes. This was similar to the Concerned group, who were also engaged but not as involved as the Alarmed group. The Cautious segment believed that global warming was an issue however did not view the problem as a personal threat and therefore had no sense of urgency. The Disengaged group did not think much of the issue, but responses suggested they would be the most likely to change their minds about global warming. The Doubtful segment believed that if global warming was happening, it was because of natural environmental changes and that America was doing enough to respond to the threat. Finally, the Dismissive group, like the Alarmed segment, were engaged with the issue but believed that global warming was not happening and did not warrant a personal or societal response (Maibach et al., 2011). This research was then used to develop screening instruments to accurately categorise future respondents into the aforementioned clusters (Maibach et al., 2011). This research demonstrates the success of constructing meaningful clusters to obtain a wealth of information to inform more effective campaigns in the environmental context. Whilst the research shows success in defining more homogenous groups, it should be considered that following a theoretical approach, such as shown in the research by Campo et al. (2012), may enable more measured message recommendations around variables that are evidenced to influence behaviour, such as the predicted relationships between variables in the EPPM (Witte, 1992)

A study by Poortinga and Darnton (2016) also used the segmentation method to develop a model to encourage sustainability policy engagement for the Welsh government. A survey was distributed to 1,538 participants, using thirteen variables to construct clusters. These included personal values, views on sustainability and sustainable living, attitudes towards climate change and energy security, and attitudes towards community and place (Poortinga & Darnton, 2016). A *k*-means cluster analysis resulted in six clusters that differed significantly in terms of gender, age, household type, tenure, social grade and Welsh identity (Poortinga & Darnton, 2016). The clusters were titled “Enthusiasts”, “Pragmatists”, “Aspirers”, “Community-focused”, “Commentators”, and “Self-reliant”. Each cluster also differed in regard to their reported environmental behaviour intentions (Poortinga & Darnton, 2016). See Table 11outlining a brief description of each cluster.

Table 11

Defining Characteristics of Clusters (Poortinga & Darnton, 2016)

Cluster	Defining characteristics
Enthusiasts (*n*=257)	• Highly engaged with all aspects of sustainability • Most willing to engage in sustainability behaviour
Pragmatists (*n*=321)	• Willing to engage in most sustainability behaviours • Less ideological than the Enthusiasts and involved with sustainability issues
Aspirers (*n*=232)	• Youngest segment • Little involvement in environmental and social sustainability • Considered economic sustainability important • Least likely to engage in sustainability behaviour
Community-focused (*n*=304)	• Older segment • More engaged with the community and economic sustainability • Positive views on community and place • Likely to adopt energy-efficiency measures
Commentators (*n*=179)	• Older segment • More engaged with the community and economic sustainability • Negative attitudes regarding climate change • Highly concerned about energy security • Likely to adopt energy-efficiency measures
Self-reliant (*n*=244)	• Dis-engaged with all aspects of sustainability • Least willing to perform sustainability behaviours

This research again demonstrates the effectiveness of a segmentation strategy in meaningfully separating like-groups in the environmental context. Using the segmentation techniques has provided clearly differentiated groups that vary across a number of dimensions, most notably attitudes towards economic, social and environmental sustainability behaviour intentions (Poortinga & Darnton, 2016). This information could be used to engage individuals across relevant sustainability policy areas, depending on the population's needs or opinions at the time. This approach would enable more tailored communication and behaviour change initiatives in this context (Poortinga & Darnton, 2016). However, again, it is argued that a theoretically driven approach would more meaningfully distinguish groups relevant to the target outcomes.

The research by Maibach et al. (2011) and Poortinga and Darnton (2016) both segmented audiences based on their values and beliefs about broad global issues such as climate change. More relevant to the current thesis is an example of the segmentation technique used in the water security context. This is seen in the study conducted by Gilg and Barr (2006), who used the segmentation methodology to identify the characteristics of ‘water savers’ for policymakers to more accurately develop targeted initiatives for water conservation. Specifically, the research examined the commonalities between the frequency of water-saving, energy conservation, green consumerism, and water management behaviours in homes located in Devon, United Kingdom. In all, 1,600 households were randomly selected and received a survey which included questions about environmental action, socio-demographic information and attitudes towards environmental action (Gilg & Barr, 2006).

A response rate of 79% was obtained. Among other analyses, a cluster analysis was performed, resulting in four defined clusters of individuals based on commonalities between reported behaviours. The groups were termed the “Committed environmentalists”, “Main-stream environmentalists", "Occasional environmentalists", and "Non-environmentalists". Table 12 outlines the defining characteristics of each cluster group.

Table 12

Defining Characteristics of Clusters (Gilg & Barr, 2006)

Cluster	Defining characteristics
Committed environmentalists (*n*=294)	• Likely to engage in water and energy-saving activities • More likely to own a rainwater tank • Oldest group • Smaller households and tended to own their own home • More likely to have been formally educated • More likely to be a member of a community organisation
Main-stream-environmentalists (*n* = 412)	• Likely to engage in water and energy-saving activities • Smaller household
Occasional environmentalists (*n* = 505)	• Largest cluster • Much less committed to behaviours than main-stream and committed groups • Very few individuals owned water butt or water 'hippo'

Cluster	Defining characteristics
Non-environmentalists (n = 43)	• Smallest cluster • Not engaged in water-saving behaviour • Very unlikely to own water-saving devices • Comprised of more men • Lower incomes

The results of the above study suggest several distinguishing factors policymakers can target to encourage certain groups to engage in water-saving behaviour (Gilg & Barr, 2006). The segmentation approach appears to provide a much more comprehensive description of a population or target area based on behaviour. Therefore, it is argued to be useful in the environmental context where such strategies for behaviour change are considered necessary.

A similar approach in the water security context using an Australian sample was used by Dean et al. (2016), who segmented a sample of 5,194 individuals based on age, gender, education, and residents' state. Participants were recruited via an online social research company and were asked to complete a survey that assessed water-related knowledge (cognitive engagement), attitudes to alternative water sources and household environmental identity (emotional engagement), behavioural measures such as water-saving and pollution-reduction activities (behavioural engagement), demographics, household characteristics, water-related life experience and psychosocial characteristics (Dean et al., 2016). The study was based on the premise that water-saving initiatives were broadly-based and thus were rarely relevant or aligned to the value of those who view them. Therefore, targeting specific social groups or settings was proposed to increase engagement in water-saving strategies (Dean et al., 2016).

Hierarchical agglomerative cluster analysis was used to identify water engagement clusters, with this approach allowing groups to emerge from the data naturally. The analyses produced five clusters that displayed significant differences between many demographic, household and psychosocial characteristics (Dean et al., 2016). Table 13 below shows the cluster labels, their percentage of the sample and the top five ranked factors characterising each cluster, as defined by the researchers through odds ratio analyses.

Table 13

Defining Characteristics of Clusters (Dean et al., 2016)

Cluster	Defining characteristics
Disengaged (12.2%)	• Less experience of behaviour change during restrictions • Weak social norms: ‘Others want me to save water’ • Less likely to have a garden • Low rates of North-West European ancestry
Aware but inactive (15.1%)	• Less likely to have a garden and own a home • Lower waterway use • Weak social norms: ‘Others save water’ • High rates of university education
Active but not engaged (31.4%)	• More likely to have a garden • Lower rates of university education • Weak social norms: ‘Others want me to save water’ • Lower rates of North-West European ancestry • Greater experience of water restrictions

Cluster	Defining characteristics
Engaged but cautious (20.1%)	• More likely to own a home and have a garden • Less likely to live in urban areas • Strong social norms: 'Others want me to save water'
Highly engaged (21.0%)	• Higher rates of North-West European ancestry • Strong social norms: 'Others save water' • Higher rates of university education • Greater experience of behaviour change during restrictions

To summarise, the Disengaged cluster exhibited low scores for all engagement items (cognitive, emotional, and behavioural). The Aware but inactive cluster had high scores for water-related knowledge and support for alternative water sources and low scores for environmental identity and all behaviours. The Active but not engaged cluster reported high water-saving and pollution-reduction behaviours; however, they had low scores for cognitive and emotional engagement and uptake of water-saving devices. The Engaged but cautious cluster exhibited high scores for all engagement indicators (except for support for alternative water). The Highly engaged cluster had high scores on all engagement indicators (Dean et al., 2016).

This research demonstrates, yet again, the diverse social and contextual differences within a population and the opportunity for targeted interventions to encourage water-saving behaviour. For example, as stated by Dean et al. (2016), the Disengaged group displayed characteristics that could be perceived as barriers to water-related engagement (i.e., low income, households with children, less likely to own a home and low life satisfaction). Therefore, the attention of these individuals may be more focused on managing everyday routines and the challenges of social disadvantage. Low rates of homeownership and gardens also limit opportunities to promote the uptake of garden practices or install water-efficient devices. Therefore, for this group, engagement initiatives may be better received by community development approaches that build social capital and support community members working together (Dean et al., 2016). This research provides evidence for using this approach in the water security context. Whilst the above research in this context was not theoretically driven, it demonstrated the diversity of populations and also gathered crucial information to inform initiatives to maintain or enhance engagement in those already engaged or to build engagement in the disengaged groups.

5.3 Concluding Remarks

Whilst there is a wealth of literature demonstrating different strategies for segmentation, very few discuss the actual implementation of these strategies and their effectiveness in changing behaviour. Furthermore, limited literature uses a theoretically driven method to apply audience segmentation in the environmental context. The usefulness of such an approach has been demonstrated by Campo et al. (2012) and Rimal et al. (2009), who used a theoretical basis (such as the components within the EPPM) in the health context to construct clusters, giving an arguably more extensive and comprehensive indication of individual behavioural determinants. The success of this methodology justifies further exploration of this approach in the water security context, as well as the measurement of outcome variables to determine segmentation success.

Chapter 4 found that EPPM variables of perceived threat, self-efficacy, and response-efficacy could significantly predict variability in water conservation behaviour. As well as showing predictive power for water-saving behaviour, using the EPPM variables in clustering groups is also supported by previous literature (Campo et al., 2012). The following chapter builds upon the results in chapter 4 and further examines the sample from the Townsville region in terms of their attitudes, cognitions, knowledge and behaviours related to water security. Chapter 6 will use the EPPM as a theoretical basis to construct clusters based on shared perceptions of the key variables within the model (perceived threat, self-efficacy and response-efficacy) while examining whether they are able to predict behaviour like the EPPM hypothesises when groups are formed. Exploring the underlying characteristics and demographic differences between groups will provide additional information to assist in the tailored constructions of communications to encourage water conservation behaviour.

Given that the communication of water security threats may be of increased importance in the near future, this approach may provide necessary guidance to formulate appeals or messages in this context and to branch away from the previous ‘one size fits all’ approach to environmental campaigns. This may achieve greater engagement in water conservation behaviour, address the variability of perceptions around water security issues and work towards closing a significant gap in the literature. Therefore, the current study aims to provide recommendations for implementing messages within an at-risk community.

Chapter 6: Results Study 1b – Cluster Analysis

6.1 Study Hypotheses

Policy approaches to water management often consider communities or households as homogenous units, falsely implying identity, harmony and cooperation (Head, 2007). However, communities receiving water services may comprise of different "sub-groups" that do not share common priorities or views about such services. The differing perceptions of a water-related event may impact risk message perception and, as a result, mitigation behaviours. Furthermore, segmenting audiences has been suggested to be an effective way to ensure that interventions and messages are tailored to a more specific audience to increase behaviour, attitudes or intentions (e.g., Campo et al., 2012; Dean et al., 2016; Gilg & Barr, 2006; Maibach et al., 2011; Poortinga & Darnton, 2016; Rimal et al., 2009).

Currently, no known literature uses the EPPM as a theoretical basis to segment audiences in the water security context. Due to the apparent gap in the literature and the predictive ability of the variables within the EPPM for water conservation behaviour as found in Study 1b, the following hypothesis was constructed:

Hypothesis 3: *It was predicted that the variables within the EPPM can be used to segment the residents of Townsville into clusters based on their perceptions of threat, self-efficacy and response-efficacy related to the water security issue within the region, whilst still holding true to the model's original hypotheses.*

To explain Hypothesis 3 further, once clustered, it is predicted that the relationships between threat and efficacy variables will still predict behaviour in the way the EPPM hypothesises. For example, and to put simply, a combination of threat and efficacy will produce a change in behaviour and thus engagement in a danger control response, heightened threat perceptions with inadequate efficacy perceptions are predicted to result in fear control responses, and no threat or efficacy will result in no behavioural response (Witte, 1992).

The defining characteristics of each cluster will be explored to determine which variables could be used to provide recommendations for future communications regarding water security issues in the Townsville region. Hypotheses were not made for these analyses as they were exploratory.

6.2 Method

The Participants, Materials, Measures and Procedure are the same as in chapter 4 (see sections 4.3.2, 4.3.3, 4.3.4, 4.3.5). Below is all information pertaining to the cluster analysis, Results and Discussion for this component of Study 1b.

6.3 Data Treatment and Analysis

The data treatment was the same as presented in chapter 4 (section 4.3.6) as the same data set was used. In addition, a K means cluster analysis was conducted using the R Studio statistical package ‘cluster’. This method divides subjects into clusters such that those assigned to the same cluster are as similar as possible, while subjects belonging to different clusters are as dissimilar as possible (Dolnicar et al., 2018). Before clustering the variables, threat, self-efficacy, and response-efficacy were standardised into Z-scores using SPSS. These standardised variables were then used to run the cluster analysis. *K*-means cluster analysis was selected as the method for defining clusters as this analysis allows researchers to choose the number of clusters a priori (Jain & Dubes, 1988). This method is where segmentation variables are known in advance and are used to determine the number of clusters. It is also recommended that a ratio of 100 participants per variable be entered into the cluster analysis to be statistically sound (Dolnicar et al., 2018). Therefore, given three variables were to be used to create clusters, over 300 participants were recruited. For this study, the number of clusters was chosen using the elbow method, which showed that three clusters were the best fit for the data collected (Kodinariya & Makwana, 2013). Refer to Appendix F for the R code used to conduct the analysis.

After clustering participants into groups, ANOVAs were conducted to examine the difference between each cluster group on all demographic, EPPM, behaviour, negative impact, perceived responsibility, media quality and media quantity variables. A hierarchical multiple regression analysis was also conducted to examine whether cluster membership predicted water conservation behaviour. Part and partial correlations were also calculated to determine the strength of the relationships between relevant variables.

6.4 Results

6.4.1 Cluster Demographics

The cluster analysis produced three distinct groups in the Townsville sample. Cluster 1 consisted of 117 participants (42 men, 74 women, and one who did not indicate their gender), with 56% of the cluster indicating they were homeowners. Out of the 117 participants, 101 (86%) selected Townsville was in Level 3 water restrictions (the correct response when the survey was active), which was the lowest of all cluster groups. Additionally, only 39% of this cluster correctly identified all five behaviours enforced by the TCC (as well as other non-TCC enforced behaviours) as part of the Level 3 water restrictions at the time of the survey, which was the least number of participants compared to the other clusters. Fifteen percent of this cluster selected *only* the five TCC enforced behaviours. The majority of this group (56%) indicated that two adults lived in the home, and 62% stated no children lived in their household.

Cluster 2 consisted of 90 participants (34 men, 55 women, and one who did not indicate their gender). Eighty-eight percent of cluster 2 indicated they were homeowners, which is highest compared to other cluster groups. Out of the 90 participants, 85 (94%) selected that Townsville was in Level 3 water restrictions (the correct response when the survey was active). Additionally, 51% of this cluster correctly identified all five behaviours enforced by the TCC (as well as other non-TCC enforced behaviours) as part of the Level 3 water restrictions at the time of the survey. Fourteen percent of this cluster selected *only* the five TCC enforced behaviours. Most of this cluster (63%) indicated that two adults lived in the home, and 62% indicated no children lived in their household.

Cluster 3 consisted of 156 participants (42 men, 114 women). Seventy-one percent of cluster 3 indicated they were homeowners. Out of the 156 participants, 149 (96%) selected that Townsville was in Level 3 water restrictions (the correct response when the survey was active). This result was the highest of all cluster groups. Additionally, 60% of this cluster correctly identified all five behaviours enforced by the TCC (as well as other non-TCC enforced behaviours) as part of the Level 3 water restrictions at the time of the survey, which was the most compared to other clusters. Ten percent of this cluster selected *only* the five TCC enforced behaviours. The majority of this sample (65%) indicated that two adults lived in the home, and 55% stated no children lived in their household. Refer to Table 28 in Appendix H for each behaviour and cluster breakdown.

6.4.2 Results Pertaining to EPPM Variables

The means, standard deviations and F-values for all ANOVAs examining the differences in each EPPM variable based on cluster group are shown in Table 14 below.

Table 14

Relevant Statistics for EPPM Variables Based on Cluster

	Cluster 1 (*n*= 117)	Cluster 2 (*n*= 90)	Cluster 3 (*n*= 156)	F-value
		M (SD)		
Threat	3.00 (0.53)	4.30 (0.47)	3.85 (0.53)	171.38**
Self-efficacy	3.24 (0.63)	3.61 (0.71)	4.10 (0.52)	66.80**
Response-efficacy	2.83 (0.86)	1.86 (0.73)	3.91 (0.66)	224.95**
Behaviour (Total)	47.64 (13.88)	51.60 (12.97)	60.43 (10.85)	37.87**
Non-TCC enforced behaviour	35.69 (10.32)	38.02 (9.93)	45.55 (8.25)	41.12**
TCC enforced behaviour	11.95 (5.10)	13.58 (4.75)	14.88 (4.46)	12.73**

Note. *$p < .05$, **$p < .01$

One-way ANOVA analyses indicated a significant difference in perceived threat, self-efficacy, and response efficacy levels between all three cluster groups. Post-hoc analyses also revealed a significant difference between all clusters on all variables presented in Table 14 (all *ps* < .01), with the largest variation between response-efficacy followed by perceived threat across clusters. Cluster 1 had the lowest ratings of perceived threat and self-efficacy when compared to other groups. Cluster 2 had the highest rating of perceived threat, and the lowest rating for response-efficacy perceptions compared to other cluster groups. Cluster 3 had the highest ratings for both perceived self-efficacy and response-efficacy compared to other groups.

Differences in water conservation behaviour between each of the clusters were also examined. Results revealed a significant difference between total water conservation behaviours across the three clusters. Post-hoc analysis revealed that the significant difference was between cluster 1 and cluster 3 ($p < .01$) as well as cluster 2 and cluster 3 ($p < .01$). Cluster 1 reported the least water conservation behaviour, and cluster 3 reported the most.

Significant differences were also found between non-TCC enforced water-conservation behaviours based on cluster groups. Post-hoc analysis again revealed that the significant differences were between cluster 1 and cluster 3 ($p < .01$) as well as cluster 2 and cluster 3 ($p < .01$). The same analysis was conducted to examine differences in TCC's enforced behaviours for Level 3 water restrictions and the cluster groups. Results found a significant difference between TCC recommended behaviours based on cluster group. Post-hoc analysis revealed that a significant difference was found between cluster 1 and cluster 2 ($p = .045$; 95% CI [-3.23, -.03]), as well as cluster 1 and cluster 3 ($p < .01$). On average, participants within cluster 1 had the lowest scores for non-TCC enforced water conservation behaviours, and TCC enforced behaviours of all cluster groups, and cluster 3 the highest.

6.4.3 Regression Analysis

A hierarchical multiple regression analysis was conducted to examine if cluster membership was a predictor of total water conservation behaviour, over and above the demographic variables. The demographic variables of gender, age, years lived in Townsville, and homeownership were entered into the model first. Cluster membership was then added to determine if membership could significantly predict behaviours over and above demographic factors. Cluster 1 and 2 were dummy coded with cluster 3 as the reference category in the analysis. Prior to this analysis, the relevant assumptions of this statistical test were analysed. First, there were no high correlations between the independent variables, and the Durbin Watson value was less than two (1.92). All collinearity statistics (VIF and tolerance) were within acceptable limits (<10 and >.20, respectively). Therefore, the assumption of non-multicollinearity was met. Inspection of residual and scatter plots also indicated the assumptions of normality, linearity and homoscedasticity were all satisfied.

Results of the hierarchical multiple regression analysis are presented in Table 15. Results indicate that the demographic variables accounted for 8.4% of the variance in total water conservation behaviour ($F_{(4,322)}$= 8.50, $p < .01$) in Stage 1. Gender and age were significant predictors of water conservation behaviour, with gender explaining 5.11% of the unique variance. Neither years lived in Townsville, nor homeownership were significant predictors of water conservation behaviour. The addition of the cluster membership dummy variables in Stage 2 added a significant 13.6% of variance to the prediction of total water conservation behaviour ($F_{(6,320)}$= 16.03, $p < .01$). In this model, gender and cluster membership were significant predictors of water conservation behaviour. Results indicated that over and above demographic variables, respondents in clusters 1 and 2 performed significantly less behaviour than those in cluster 3. The final model accounted for 21.7% of the variance in total water conservation behaviour. Refer to Appendix G for SPSS output.

Table 15

Predicting Water Conservation Behaviour Based on Demographic Variables and Cluster Membership

	B (SE)	β	95% CI	sr^2	t
Stage 1 (Constant)	33.47 (5.33)		[22.99-43.95]		6.28**
Years lived in Townsville	0.05 (0.06)	0.06	[0.06-0.16]	< .01	0.94
Gender	6.53 (1.53)	0.23	[3.52-9.54]	.05	4.27**
Age	0.18 (0.06)	0.21	[0.05-0.31]	.02	2.79**
Homeownership	0.92 (2.06)	0.03	[-3.16-4.97]	< .01	0.45
Stage 2 (Constant)	43.11 (5.09)		[33.08-53.13]		8.46**
Years lived in Townsville	0.07 (0.05)	0.08	[-0.03-0.17]	< .01	1.39
Gender	5.26 (1.42)	0.18	[2.46-8.06]	.03	3.69**
Age	0.13 (0.06)	0.15	[0.01-0.25]	0.01	2.17*
Homeownership	0.77 (1.91)	0.03	[-2.99-4.53]	< .01	0.40
Cluster 1	-10.92 (1.57)	-0.38	[-14.01—7.84]	0.12	-6.97**
Cluster 2	-8.70 (1.74)	-0.27	[-12.13—5.28]	0.06	-5.00**

Note. **p* < .05. ***p* < .01; Cluster 3 used as the reference category for cluster membership in this analysis.

6.4.4 Results Pertaining to Other Relevant Variables

A series of one-way ANOVAs were also conducted to examine the differences between cluster groups on the remaining variables. Means, standard deviations and F-values for all ANOVAs of all variables of interest for each cluster group are presented in Table 16 below.

Table 16

Relevant Statistics for Remaining Variables Based on Cluster

	Cluster 1	Cluster 2	Cluster 3	F-value
		M (SD)		
Age	36.50 (16.03)	49.22 (12.88)	43.29 (15.47)	18.28**
Years lived in Townsville	15.54 (11.70)	24.98 (18.78)	18.66 (14.34)	9.38**
Negative impact (Ind.)	2.47 (1.03)	3.93 (0.97)	3.10 (1.00)	54.29**
Negative impact (Fam. and friend)	2.50 (0.93)	3.91 (0.92)	3.08 (0.95)	58.55**
Negative impact (Townsville)	3.32 (0.94)	4.44 (0.74)	3.99 (0.79)	48.70**
Negative impact (Environment)	3.31 (1.15)	4.44 (0.75)	4.17 (0.83)	44.58**
Responsibility (Individual)	2.36 (1.01)	1.89 (0.95)	2.66 (1.21)	14.23**
Responsibility (Community)	2.67 (1.14)	1.95 (1.02)	2.86 (1.25)	17.72**
Responsibility (Local Gov.)	3.97 (0.85)	4.48 (0.68)	4.24 (0.82)	10.44**
Responsibility (State Gov.)	3.96 (1.00)	4.64 (0.68)	4.29 (0.80)	16.99**
Barriers	47.37 (8.53)	51.12 (8.14)	37.01 (7.40)	106.56**
Media satisfaction (Amount)	3.02 (0.98)	3.07 (1.09)	3.28 (1.02)	2.43
Media satisfaction (Quality)	2.95 (0.92)	2.87 (1.09)	3.22 (0.97)	4.43*

Note. **p* < .05, ***p* < 0.01

A one-way ANOVA found a significant difference in age between the three cluster groups, with post-hoc analyses revealing a significant difference in age between all clusters (all *ps* < .05), with cluster 1 being the youngest group, on average and cluster 2 the oldest. The same analysis was also conducted to test for differences between the three cluster groups and their length of time lived in Townsville. Results found a significant difference between the clusters and post-hoc analyses revealed a significant difference between cluster 1 and cluster 2 ($p < .01$), as well as cluster 2 and cluster 3 ($p = .008$), with cluster 1 living in Townsville the shortest time, and cluster 2 the longest, compared to other cluster groups.

Differences in participants' perceived negative impact of the lack of water supply on themselves, their family and friends, Townsville, and the environment between each of the clusters were also examined. The analysis found a significant difference between the negative impact on the participant, the participant’s family and friends, Townsville, and the environment across the three clusters. Post-hoc analysis also revealed a significant difference between all clusters and all perceived negative impact variables at the $p < .05$ level, except between cluster 2 and cluster 3 on the negatively impacting the environment variable ($p = .087$). On average, individuals in cluster 1 reported the lowest scores and cluster 2 the highest scores for all perceived negative impact variables compared to other clusters.

Differences in individual perceived responsibility of the Townsville water supply on themselves, the community, and the TCC and state government between each of the clusters were also analysed. Significant differences were found between the three clusters for perceived responsibility belonging to the participant, the community, the TCC and the state government. For perceived responsibility belonging to the participant and the community, the post-hoc analysis revealed that there was a significant difference found between clusters 1 and 2 ($p = .007$), and clusters 2 and 3 ($p < .01$). Cluster 2 reported the lowest ratings and cluster 3 reported the highest ratings of perceived responsibility belonging to the individual and the community compared to other clusters. For perceived responsibility belonging to the TCC, post-hoc analysis revealed a significant difference between clusters 1 and 2 ($p < .01$). For perceived responsibility belonging to the state government, post-hoc analysis revealed a significant difference between all clusters (all *ps* < .05). Cluster 3 reported the lowest ratings for perceived responsibility belonging to TCC and the state government, and cluster 2 reported the highest ratings for perceived responsibility belonging to TCC and the state government compared to other clusters.

A one-way ANOVA found a significant difference in total behaviour barrier scores between the three clusters, with post-hoc analyses revealing a significant difference between all clusters (all *ps* $< .01$). On average, cluster 2 reported the most barriers to behavioural engagement, and cluster 3 reported the least.

Differences in perceived satisfaction levels with the amount of information the public was given regarding the water restrictions and each of the clusters were also examined. The analysis found no significant difference between the three clusters and participant satisfaction with the amount of information ($p = .089$), with cluster 1 reporting the lowest satisfaction ratings for this variable. The same analysis was conducted for satisfaction with the quality of information the public was given regarding the water restrictions. The analysis found a significant difference between the satisfaction with the quality of information across the three clusters. Post-hoc analysis revealed that the significant difference was between cluster 2 and cluster 3 ($p = .022$), with cluster 2 reporting the lowest satisfaction ratings for this variable. Cluster 3 reported the highest satisfaction with the amount and quality of information the media ratings compared to other clusters. Below in Table 17 is a summary of the descriptions of each cluster.

Table 17

Summary of Key Descriptives of each Cluster

Cluster	Key descriptives
1	• 32% of the sample • Mid-range ratings of perceived threat and self-efficacy (lowest of all groups) • Low rating of response-efficacy • Youngest of all cluster groups and lived in Townsville for the shortest time • Smallest percentage of homeowners • Reported the least water conservation behaviour of all clusters
2	• 25% of the sample • High rating of perceived threat (highest of all clusters) • Mid-range rating for perceived self-efficacy • Low rating for perceived response-efficacy (lowest of all cluster groups) • Oldest out of all clusters and lived in Townsville for the longest time • Mostly comprised of homeowners
3	• 43% of the sample • Mid to high rating of perceived threat • Mid-range ratings for perceived self-efficacy and response-efficacy (highest of all clusters) • Reported the most water conservation behaviour of all clusters

6.5 Discussion

This chapter aimed to determine if the variables of the EPPM could be used to cluster individuals into like-minded groups and to examine whether the relationships between the variables as described by the EPPM held true after segmenting. Overall, these findings demonstrate the large variability in individual perceptions within a community experiencing drought and that the behaviours of each group appeared to align with the EPPM predictions. The study also aimed to explore the defining characteristics of each cluster and determine which variables would be recommended for use in future communications regarding water security issues.

6.5.1 Cluster 1: The Unconcerned Cluster

According to the EPPM, threat perception is the first stage of the behavioural process. If a threat is perceived, individuals will evaluate the situation based on their efficacy perceptions and act accordingly (Witte, 1992). Cluster 1 reported the lowest level of perceived threat compared to other clusters. With this in mind, cluster 1 could be labelled as the "Unconcerned" cluster. Additionally, this cluster had low self- and response efficacy perceptions. Therefore, due to their low levels of perceived threat, participants in cluster 1 may not have been engaging in the first stage of the behavioural process as proposed by the EPPM (Witte, 1992). This potential non-engagement would impact efficacy perceptions, the second appraisal process of the model. This combination of threat and efficacy perceptions within this group is likely why this cluster had the least reported water conservation of all cluster groups. This result is evidence of the inter-relationships between the EPPM variables and their ability to predict behaviour in the water security context.

Cluster 1 also rated perceived negative impact as the lowest on themselves, their family and friends, Townsville, and the environment. Furthermore, compared to other cluster groups, cluster 1 appeared to be the least knowledgeable about the water restriction level and the least knowledgeable about the specific behaviours enforced by the restrictions. In the study by Mankad et al. (2013), knowledge was a significant predictor of water-related behavioural intentions. The lack of knowledge shown by this cluster may also be supported by the fact this group had the lowest perceived self-efficacy of all cluster groups. This group may not have felt they knew how to act to mitigate the water problem within the community, or that, given they had the lowest threat perception of all clusters, that a threat was actually present that needed to be mitigated. Additionally, this cluster was the youngest of all groups, and as shown in both chapter 4 results and the results presented above for the current study, age is predictive of behaviour.

Furthermore, the small percentage of homeownership in the cluster may have also contributed to the low behavioural compliance within this group. Low homeownership rates mean that individuals within this cluster may have less interest in their yard's aesthetics, the uptake of water-related gardening practices or the installation of water-efficient devices. Low threat and negative impact scores may have also resulted from this group's low levels of homeownership. Additionally, given the lack of time spent in Townsville, negative environmental effects on the community may not be as personally salient to these individuals – with personal salience also argued to increase threat perceptions and thus behaviour in the environmental context (e.g., Liberman et al., 2007; McKay et al., 2004).

Despite the low reporting of behaviour, this cluster also appears to show insight into how their accountability may affect the region's water situation. The cluster rated the responsibility of the TCC and the state government the lowest compared to other groups and individual and public responsibility as the second highest. This result may indicate that this cluster may be somewhat receptive to communications regarding the water issue, particularly those targeted towards individual behaviour change in the community.

Regarding communication, aimed at changing behaviour, the Unconcerned cluster appear to require a message that will increase threat and self-efficacy perceptions. To do this, engagement would need to be tailored to a younger subset of the population, for example, through social media platforms. This group also appears to be more concerned about the negative broad environmental and Townsville City impacts of the issue compared to the negative impacts on themselves or their family and friends. Therefore, framing a message in the broader Townsville or environmental context may also be helpful and may also increase threat perceptions enough to encourage behaviour. For example, given the location of Townsville and it being well known for long periods without rainfall, perhaps framing around the lack of rainfall during these periods in the region would be most relevant.

Additionally, given this group has low homeownership rates and is, therefore, less likely to own and manage a garden, this limits the opportunities to promote the uptake of garden practices or install water-efficient devices. For this cluster, these communications could therefore focus on everyday indoor water-saving behaviour to maximise success, for example, shortened shower times or turning off the tap whilst brushing teeth. For this group specifically, engagement may also be better achieved through community-based approaches that build social capital and support community members working together. Providing specific, community-based water usage information, for example, how much water the community or suburb uses and how this might negatively contribute to the water shortage in the region, may increase threat perceptions for this cluster. These suggestions may increase the salience of the issue for this cluster and arguably increase threat perceptions (Kim et al., 2013; O'Neill & Nicholson-Cole, 2009).

Next, educating the Unconcerned cluster on the water restrictions may increase knowledge about the issue and thus self-efficacy perceptions, as individuals will know (with more confidence) the specific behaviour they can do to mitigate the problem within the region. Increasing knowledge by providing more frequent behavioural information to this cluster and also highlighting the specific recommended behaviours, both within restrictions and effective water conservation behaviours outside of restrictions, may increase cluster 1's knowledge, self-efficacy and, as a result, behavioural engagement.

6.5.2 Cluster 2: The Fearful Externalisers

Cluster 2 had the highest perceived threat rating and the lowest response-efficacy rating of all cluster groups. This indicated that they were more concerned, compared to other clusters, about the Townsville water issue and may also perceive their behaviours were ineffective in mitigating the problem. This cluster's high threat perception may also affect the cluster's ability to perform the necessary behaviour to mitigate the water security threat, or they may perceive the behaviours as ineffective in reducing the threat. Furthermore, this group also exhibited the greatest number of barriers to engaging in water conservation behaviour compared to the other clusters. It could be argued that this cluster is engaging in the fear control response, as predicted by the EPPM (Witte, 1992). When comparing cluster 2 to cluster 1, the idea of perceiving a threat and also having self-efficacy seem to be drivers of behaviour. For example, cluster 2, other than threat, has the low reported perceptions on efficacy variables, however, still has more reported behaviour than cluster 1. This again highlights the predicted relationship by the EPPM (Witte, 1992) in that if an individual does not perceive a threat, then less behaviour occurs, as evidenced by cluster 1. Cluster 2 may, therefore, best be labelled as the "Fearful externalisers" and considered the 'priority audience' for behaviour change strategies in the region.

The high threat rating is further evidenced by the fact that this cluster had the highest scores for water restrictions negatively impacting themselves, their family and friends, Townsville City, and the environment. These results may also indicate a lack of control over the issue and helplessness, given the threat appears to negatively impact all areas, and this group is the least confident in their ability to mitigate it. The lack of control perceived by this cluster may be a reason for minimal behavioural engagement. The relationship between control and behavioural compliance has been explored previously by Pedruzzi et al. (2016), where the specified outcome must have been considered controllable by the viewer for the desired action to be performed (Pedruzzi et al., 2016). Although the research by Pedruzzi et al. (2016) was conducted in the road-safety context, evidence regarding the importance of perceived control has also been found in the environmental context, where O'Neill and Nicholson-Cole (2009) suggested that perceived control increased one’s concern. Furthermore, chapter 3 provides an argument for the similarities between road-safety and environmental contexts to further highlight the potential influence of this factor.

Cluster 2, on average, were the oldest and had lived the longest in the region, so they could also have a high attachment to Townsville, contributing to their high threat perception and behaviour. As they have lived in Townsville longer, this group may see a trend in water supply occurring whereby they perceive the limited water supply as a constant threat to the region, given its location, and that individual short-term behaviours will not mitigate the permanency of this threat. It may be that this group perceives this threat as permanent but manageable, so despite their high levels of perceived threat, they still engage in some water-saving behaviour.

Cluster 2 also perceived themselves and the community as the least responsible for securing Townsville’s water supply. This result may also be supported by the fact that this group have lived in Townsville longer and therefore see that water supply is a constant threat for the region, and these individual short-term behaviours are not going to mitigate the permanency of this threat, with a preference for the government led initiatives such as the aforementioned pipeline. Cluster 2 may be engaging in a ‘maladaptive’ response or less adaptive behaviour, as it may be useful for the individual to function daily. For example, this may be placing blame or responsibility on others (e.g., government bodies) for the lack of water within the region. Exhibiting a fear control response and performing defensive avoidance responses to minimise the threat perception may reduce fear in an individual (Witte, 1994). This is supported by this group indicating that the TCC and the state government were perceived as the most responsible for securing Townsville's water supply out of all cluster groups.

The Fearful externaliser's appear to require a message that not only decreases their threat perception but also increases their response-efficacy perceptions. It seems this cluster perceives that they are not responsible for securing the water supply within the region and also perceives their actions as ineffective and thus supportive of government-led initiatives to mitigate the water security issue within the region. Communications that address why the public of Townsville plays a crucial part in water conservation and reinforcing the effectiveness of engaging in everyday water conservation behaviour would be recommended for this cluster. Such messages may help reduce the high threat perception and increase this group's response-efficacy levels by increasing the threat's controllability. Given that this group is the oldest and has lived in Townsville the longest, these individuals likely have seen the recurrent nature of drought in the region, and perhaps the failures of previous initiatives. Based on these factors, increasing behaviour in this cluster could be achieved by presenting more information about behaviours, particularly around their practicality. For example, why a particular behaviour is beneficial to resolving the issue – long-term. As a result, this approach may also reduce the number of behavioural barriers to water-saving behaviours that this group perceives.

Another concern is the high levels of the perceived negative impact the water issue has on all areas for this cluster. While threat perceptions are necessary for behavioural engagement, this particular group may be experiencing too much threat, thus having detrimental impacts on adaptive behaviour. To minimise this, messages would also need to include information on the accessibility of behaviour, highlighting how engaging is ‘simple’ and ‘doable’ for this population. Given that this group comprises mostly homeowners, messages about water-saving in the garden or saving water in the home may also be more relevant and increase perceived control over the issue, thus increasing efficacy perceptions and potentially behaviour.

6.5.3 Cluster 3: The Proactive Cluster

Cluster 3 demonstrated a relationship between threat, response-efficacy, and water conservation behaviour that aligns with the danger control response of the EPPM (Witte, 1994). Their neutral threat perception, coupled with high perceived self- and response-efficacy perceptions, according to EPPM predictions, is hypothesised to lead to greater amounts of behaviour (Witte, 1992), which is evident given cluster 3 had reported the most water conservation behaviours of all clusters. Even after controlling for demographic factors, this cluster still had higher reported behaviour. Additionally, this group had the lowest ratings of reported barriers to engaging in water conservation behaviours and had the highest reported individual and community responsibility ratings of all cluster groups. This is the ideal result according to the predictions of the EPPM (Witte, 1992), and it is promising that the highest number of the participants recruited in the sample fall into this cluster. This cluster could therefore be termed the “Proactive” cluster and is arguably the model or standard for other cluster groups.

The Proactive cluster, as its title may suggest, appeared to be the most knowledgeable about water restrictions compared to other cluster groups. This group had the highest percentage of members indicating the correct level of restrictions at the time of the survey and the highest knowledge of specific behaviours belonging to those restrictions. This shows that these individuals know what behaviours to engage in and know and trust that those behaviours will effectively minimise the water issue within the community. This result contrasts with the Unconcerned cluster (cluster 1), which had low knowledge of the issue and low reported behavioural engagement.

Although cluster 3 performed the most water conservation behaviours and was the most satisfied with the quality of information they received, giving this group further information beyond the restriction may further minimise the water problem within the region and increase their self-efficacy perceptions. Given this group appears to be highly engaged and knowledgeable about the issue, alternative approaches are recommended to foster such engagement. Engagement initiatives for cluster 3, an arguably educated group, should therefore focus on encouraging this positive environmental identity and establishing social norms related to water use, for example, behavioural prompts beyond those enforced by water restrictions. This may enable and encourage the promotion of these behaviours to others beyond this group. Social norms employ a powerful influence on pro-environmental behaviours and have been shown to reduce water use (Dean et al., 2016) and on the contrary, raise doubts around water-saving initiatives (Dolnicar & Hurlimann, 2009) in previous research. Thus, if promoted and encouraged effectively, social norms could have positive impacts on water usage in the Townsville community.

On the contrary, although this group performed the most behaviour, their knowledge of the restrictions and TCC-enforced behaviour could be expected to be higher as a result. These results may suggest a lack of deliberate and critical thought when deciding to engage in these behaviours or suggest that even though knowledge is high, emotional responses of fear may prevail, as shown in climate change literature (Norgaard, 2011). This group was aware of the threat and the consequences and perhaps applied behaviours aimed at saving water to negate such threat. This may also further suggest that knowledge of water restrictions may not contribute as much to increased engagement in water conservation behaviour for this sample. Therefore, it is again recommended that moving beyond restriction-based recommendations would be useful for this group. See Table 18 for a summary of the key communication recommendations for each of the cluster groups.

Table 18

Summary of Key Communication Recommendations for each Cluster

Cluster	Key message recommendations
Unconcerned (1)	• Increase threat perceptions - Present threat to broader environment or Townsville as a whole • Increase efficacy perceptions - Emphasise current water restriction behaviour to increase knowledge • Present information via social media • Focus on everyday indoor behaviour or large community initiatives
Fearful externalisers (2)	• Decrease/maintain threat perceptions - Consider previous experience of this cluster by emphasizing the long-term cyclic nature of weather in the region but also by providing long-term solutions to balance threat perceptions • Increase efficacy perceptions - Increase perceived control for the issue by highlighting practical behaviour recommendations - Increase perceived responsibility by emphasizing the role the public play in water conservation in the region - Home-relevant behaviours (e.g. gardens) to appeal to the large proportion of homeowners
Proactive (3)	• Maintain/increase efficacy perceptions - Provide more behavioural information beyond restrictions - Develop an environmental identity to enable continued behaviour engagement

6.6 Concluding Remarks

The current study contributed to the growing literature regarding the use of the EPPM in the greater environmental context but also specifically the water security context, by using the variables within the model as a basis to construct clusters within a community. It was demonstrated that when clustered, the hypothesis of the EPPM appeared to be upheld. This research further extends the EPPM's application in this context and allows researchers to understand and explore the threat and efficacy perceptions of a population under environmental threat. In addition, it highlights other factors, such as perceived responsibility and media impact, that may have contributed to or inhibited these perceptions and, therefore, behaviour.

With climate change continually bringing adverse change to the environment worldwide, interest in, and development of new and improved messaging to communicate such threats is imperative. While the use of fear appeals seems likely in the future, this research lays the foundations for a new strategy for distributing water-related information to targeted sub-groups within at-risk populations. Whilst clustering is not a new methodology in the water-security context (e.g., Dean et al., 2016; Gilg & Barr, 2006), nor is applying a theoretical basis to create like-minded groups (e.g., Campo et al., 2012; Rimal et al., 2009), the use of the EPPM as the theoretical basis for clustering presents a unique method to the water security context and thus fills a gap in the pre-existing literature. Additionally, the research and conclusions of Manning et al. (2013), the only research review found on the implementation of water-saving initiatives in Townsville, suggested that "program success relies significantly on the characteristics and preferences of the target community" (p.8). These recommendations are further encouraged in the current study.

This research also highlights the varying threat and efficacy perceptions with a population experiencing the same environmental threat. Based on previous research and current findings, it could be suggested that when populations are not homogenous in terms of their opinion, beliefs, or behaviour about an issue, risk communication needs to reflect the diversity between individuals to succeed in this context (e.g., Hine et al., 2014; Maibach et al., 2011).

Whilst the current study had promising results, there is still a substantial amount of unexplained variability in behavioural engagement. As they occur in the real world, environmental events can be argued to be inherently threatening to individuals (O'Neill & Nicholson-Cole, 2009; Xue et al., 2016), due to their perceived enormity, uncertain consequences, uncontrollability and high stakes (Australian Government: Department of Home Affairs, 2018; Lorenzoni et al., 2007). This means that communication or messages may not need to be constructed in a deliberately threatening way, as the event itself is already perceived as inherently threatening to individuals. In this context, it may be that the fear experienced is “implicit”, in that the mere mention of the threat may evoke past cognitions about the threat in the audience and result in an emotional reaction of fear. This has been shown in the current study above, where threat perceptions are present without deliberately attempting to manipulate them through messaging. As a result, the extensive effect of such events, and also perceived experience of them, whether that be global climate change, drought or a flood that impacts an entire community or geographical area, needs to be considered when evaluating individual responses to such events. The significant perceived impact of environmental events is also usually coupled with high uncertainty and no clear or direct efficacy information to mitigate these threats (Gleick, 2012; Hart & Feldman, 2014). One way to address these issues and one consistent recommendation, both in the current study and in the aforementioned literature, is to understand the perceived psychological distance of an event to an individual (Spence, Poortinga, & Pidgeon, 2011). The concept of psychological distance and its application in the water security context will form the content of the forthcoming chapters of this thesis.

Chapter 7: Psychological Distance

So far, this thesis has demonstrated the robustness of the EPPM, with chapter 4 highlighting the successful use of the EPPM variables, threat, self-efficacy, and response-efficacy in predicting water conservation behaviour intentions. In chapter 6, Study 1b further demonstrated the use of the factors within the EPPM to segment individuals facing a significant threat to water security. Three clusters were formed based on similar ratings on the variables of perceived threat, self-efficacy, and response-efficacy. Each group appeared to align with the hypotheses of the EPPM with regard to their reported water conservation behaviour. Furthermore, this research informed and provided recommendations for environmental threat communication in the Townsville context. It was concluded that the EPPM provides an appropriate basis for enquiry for future environmental threat communication, particularly in areas facing threats to water security.

Threat perceptions were found to be a significant predictor of behaviour in chapter 4 and an important factor for understanding different levels of water conservation behaviour between clusters in chapter 6. Further, threat perceptions, given they are the first appraisal process of the EPPM, are a crucial part of the workings of this model. Additionally, a considerable amount of unexplained variance was found in the prediction of water conservation behaviour in Study 1a. As discussed earlier in this thesis, threat perceptions of water-related environmental events can be complex, given their unpredictable and uncontrollable nature (Lorenzoni et al., 2007). Therefore, threat perceptions of water insecurity warrant a more in-depth investigation given its substantial, relatively unknown effect and influence on water conservation behaviour. Conducting such research may provide relevant information for other water security threats, environmental threats, or threat perceptions in general.

Perceived susceptibility to environmental threats, such as water security issues, can be minimised by the practice of conservation or sustainability behaviours. However, for these behaviours to be most effective for long-term environmental benefit, they need to occur before the presence of an environmental threat and be performed by multiple individuals (Gifford, 2011; IPCC, 2014). There is a significant challenge in convincing individuals to engage in preventative behaviour, particularly when that behaviour prevents an environmental threat that ‘may’ occur in the uncertain future. In the environmental context, there is often a disparity between one’s current reality and the environmental disaster one is trying to avoid. One way to best conceptualise this distance between the self and this future ‘event’ is through the concept of psychological distance. Psychological distance is the extent to which an event, object or idea is absent from an individual’s direct experience (Liberman et al., 2007). It could be argued that psychological distance may play a role in individual perception of threat.

Previous research in the health and road safety contexts has suggested that when a threat is not considered fearful by the individual, it could be due to increased psychological distance (Kim et al., 2013; Scannell & Gifford, 2013; Spence, Poortinga, & Pidgeon, 2011). In the environmental context, individuals find environmental threats challenging to grasp, given they are, at times, perceived as invisible and occur gradually over time (Gifford, 2011). It is never fully known how severe the event will be, when it will happen, what effects it will have and who it will affect. Additionally, in their most general sense, environmental threats, and the communication of events in terms of preparedness is psychologically distant on all accounts. Communications regarding climate change have been reported to decrease threat perceptions via the mechanism of increased psychological distance (Scannell & Gifford, 2013; Spence, Poortinga, & Pidgeon, 2011). More specifically, in research conducted by Kim et al. (2013), estimates of threat susceptibility to climate change were not a predictor of the performance of environmental mitigation behaviour. It was suggested that the unusual finding might have resulted from individuals perceiving the issue as too remote, in terms of space and time, or psychologically distant (Kim et al., 2013). This perception, therefore, may have decreased an individual's perceived susceptibility to the issue and discouraged them from engaging in mitigation behaviour. The large, widespread, global, and non-visible adverse effects of such an issue may have contributed to this perception. In Study 1, threat susceptibility was not directly measured, therefore this limitation, in addition to this finding by Kim et al. (2013) highlights the importance of exploring the variable in greater depth in the water security context.

Additionally, research by O'Neill and Nicholson-Cole (2009) suggested climate change was important and concerning but disempowering on a personal level. Again, this raises the question of what impact psychological distance has on individual threat perceptions and behaviour, specifically in the environmental context. It seems that increased psychological distance may impact threat perceptions by reducing the severity of perceived threats and susceptibility to them if they are seen as distant, potentially having a flow on effect for behaviour, as a low threat perception has negative implications for behaviour change (Hatchell et al., 2013; Rigby et al., 1989; Ross et al., 1990; Shanahan et al., 2000). Understanding what is considered threatening about an environmental threat, relative to its proximity to an individual (whether close or far), and the immediate or delayed consequences of behaviour may provide valuable information to construct communications that encourage behaviour to assist in mitigation efforts.

Research conducted by Kortenkamp and Moore (2006) explored this premise by examining the temporal impacts of environmental behaviour. The study was based on the assumption that acting in a way that harms the environment (e.g., wasting water by taking a long shower) has immediate benefits but delayed negative consequences for an individual

(Kortenkamp & Moore, 2006). There were 112 participants recruited from an introductory psychology subject pool, and the study was split into two tasks. The first task examined participants' willingness to cooperate after exposure to three hypothetical resource dilemmas about real-world environmental problems. These problems were manipulated in terms of the time it would take for the effects of resource depletion to occur. The scenarios were stories based on overfishing, the acquisition of water rights for farmers, and water conservation in various areas of America. Participants were asked to imagine the situations as if they were experiencing them. After watching the scenarios, participants were asked how much they would be willing to cooperate with the dilemma (e.g., forfeit water rights) in 12 different conditions. These conditions were based on timing and uncertainty, this being the timing of the negative consequences of not cooperating and the probability that the negative consequences of not cooperating would occur, respectively (Kortenkamp & Moore, 2006). The second task asked participants to give up extra course credit points to generate monetary donations to local environmental groups. In this task, time was again manipulated by describing the mission of the environmental group, either to make improvements for the current city residents or the next generation. Participants viewed each scenario then completed several questions measuring individual differences and behaviour (Kortenkamp & Moore, 2006).

Findings suggested temporal dilemmas influenced an individual's decision to cooperate. In the hypothetical resource dilemma scenarios, participants were more willing to cooperate and therefore reduce resource consumption when the effects (i.e., overconsumption) were occurring sooner and when uncertainty was low. In addition, in the real resource dilemma activity (credit point activity), participants were also willing to cooperate when the positive benefits of cooperating were occurring earlier (Kortenkamp & Moore, 2006). These results suggest the positive influence temporal information has on one's decision-making. The more immediate the effects are, whether positive or negative, the more likely one would reduce resource consumption. These results indicate that the temporal consequences or benefits may need to occur sooner for behaviour to occur. It seems that environmental behaviour operates similarly to most others in that guaranteed reward is the best reinforcer of the behaviour. In this instance, the temporality of an event’s effects' is likely a behavioural facilitator.

In another study also in the broader environmental context, Milfont et al. (2014) examined the psychological barriers to climate change beliefs and concerns. Researchers hypothesised that uncertainty due to climate change, adverse effects often occurring in ‘distant’ places, and indirect experience were major contributors to a lack of belief or concern about climate change. The study examined the relationship between coastline proximity and climate change belief and support for a New Zealand carbon emission policy (Milfont et al., 2014). The sample consisted of 5,815 participants from New Zealand who completed a questionnaire that gathered geographical information, regional affluence, climate change beliefs and support for emission regulations. Two multi-level random coefficient models were conducted that predicted climate change beliefs and support for a New Zealand carbon emissions policy based on the distance to the coast. Both models had “distance to coast” as the variable in the first step of the model and demographic variables in step two (Milfont et al., 2014).

Results found that proximity to the coast was significantly positively associated with an increased belief in climate change and support for regulating carbon emissions. These results were irrespective of residencies’ average height above sea level, sex, age, education, political orientation and wealth (Milfont et al., 2014). Results by Milfont et al. (2014) also indicated that those who lived closer to coastal regions were more likely to experience weather-related events, consider future events, and pay more attention to warnings about weather, therefore likely contributing to their increased belief in climate change (Milfont et al., 2014). This result demonstrated the effect proximal distance has on environmental beliefs and suggested that those who experience these events more frequently may be more likely to perform mitigation behaviour.

The result is also supported by the research conducted by Spence, Poortinga, Butler, et al. (2011) and Haney (2021), where those who had a direct experience of flooding in their area were more concerned and less uncertain about climate change, in addition to also feeling more confident that their actions would mitigate such a threat. Additionally, Haney (2021) indicated that this experience increased household pro-environmental behaviour (e.g., recycling). Like the above research by Kortenkamp and Moore (2006), the psychological distance of an event could be argued to affect an individual's threat perception and, as a result, influence mitigation behaviour. In this instance, the proximity of an event or exposure to previous events are likely behavioural facilitators, meaning the closer an event is, the more likely one would behave in a way to mitigate that threat. This same relationship is hypothesised to occur in the water security context in areas that experience water insecurity more frequently. However, these relationships between psychological distance and the water security context have not yet been fully explored.

The research above briefly highlights the influence and effect distance in various forms (e.g., time and space) have on an individual's environmental concern, willingness to cooperate and the likelihood of behaving in a particular manner. Given environmental threats are often communicated with a degree of uncertainty and are distant in both their occurrence and impact, conducting research in this context is vital given the increasing concern of climate change. Evaluating and exploring individual decision-making and how people process uncertain, distant or hypothetical information will allow a more in-depth understanding of the perception of and response to threat information, particularly in the environmental context, where the relationship between threat and behaviour is somewhat unclear and ambiguous. To allow an in-depth evaluation of environmental threat communications, the CLT(Trope & Liberman, 2010) allows the construct of psychological distance to be broken into four components (temporal, spatial, social and hypothetical). This theory and its components are outlined in detail below.

7.1 Construal Level Theory

Individuals directly experience the here and now and evaluate and plan situations that are removed from their current time and space (Liberman & Trope, 2008). The future, other people, other places, and alternative realities are (currently) impossible for individuals to directly experience. Our plans, thoughts, memories, and predictions are distal entities or mental construals used to guide our decision-making about alternative realities in the event that we cannot experience them directly (Trope & Liberman, 2010). The connection between these distal entities and our decision-making can be explained by the CLT developed by Trope and Liberman (Liberman & Trope, 1998; Trope & Liberman, 2003, 2010).

CLT proposes that we form abstract mental construals of distal objects and use these construals to make decisions. This theory describes the relationship between psychological distance and the extent to which an individual’s thinking is abstract or concrete. The theory's most basic hypothesis is that the more psychological distance, the more abstract one’s thinking (Trope & Liberman, 2010). Abstract thinking, or high-level construals, consists of broad, goal-irrelevant, simple, de-contextualised features that convey the “essence” of events, usually in the future (Trope & Liberman, 2003). Abstract thinking is opposed to concrete thinking or low-level construals, which are contextual, goal-relevant and contain incidental details (Trope & Liberman, 2003). Individuals are proposed to behave differently in response to abstract or concrete construals. High-level construals are hypothesised to employ actions that address *why* individuals act in a particular manner and promote the desirability of behaviour adoption, as opposed to low-level construals being perceived as *how* individuals act a particular way, which promotes the feasibility of a behaviour's adoption (Trope & Liberman, 2003).

CLT also proposes that four types of psychological distance can alter an individual's perception. These types of psychological distance include temporal distance (time), spatial distance (physical space), social distance (interpersonal distance) and hypothetical distance (event likelihood). Table 19 outlines the conceptualisation and operationalisation of each CLT psychological distance. This table is adapted from Liberman and Trope (2014).

Table 19

Operationalisation of CLT Psychological Distances

Distance	Operationalisation example
Temporal (time)	Future vs. Past Near future vs. Far future
Spatial (physical space)	Near vs. Far Here vs. Over there
Social (interpersonal distance)	Self vs. Other Similar vs. Dissimilar Familiar vs. Unfamiliar
Hypothetical (likelihood)	Real vs. Hypothetical Likely vs. Unlikely

7.1.1 Temporal Distance

Temporal distance refers to distance in terms of time. CLT argues that our judgements and decisions regarding future events are affected by the temporal distance of those events from the individual and that an event will alter the appeal of the value associated with a low- or high-level construal (Trope & Liberman, 2003). A temporally distant event is far away in time, with more distant events perceived more abstractly (high-level construals) (Trope & Liberman, 2003). As per CLT hypotheses, close temporal events are proposed to engage low-level construals, perceiving *how* an individual would act, with far temporal events displaying the opposite (high-level construals and perceiving *why* actions).

To a context-specific example, the perceived adverse effects of climate change are predicted to occur far in the future. Further, when individuals adapt their behaviour to address an environmental issue, the positive outcomes may also take years to become visible (Schafer & Schlichting, 2014). The spatial (addressed in the following section of this thesis) and temporal distance issues have been acknowledged and investigated by Carmi and Bartal (2014) and O'Neill and Nicholson-Cole (2009). These researchers conclude that the outcomes of pro-environmental behaviour are spatially and temporarily remote compared to the outcomes of many health-promoting behaviours (Carmi & Bartal, 2014; O'Neill & Nicholson-Cole, 2009). The research by Kortenkamp and Moore (2006) above also suggested temporal dilemmas influenced an individual’s decision-making. When considering the individual, decreasing temporal distance may enable one to view more concrete details, thus increase behaviour. Communication about environmental events often includes information about the predicted timeframe an event will occur or how long it has been since an event occurred (e.g., rain). As such, temporal distance and understanding its influence on an individual’s perception may play a role in the water security context.

7.1.2 Spatial Distance

Spatial distance is the physical distance at which events occur from each other or the individual, for example, if an event is happening on your street as opposed to another country. An event or situation happening close to the individual would be considered close spatial distance, and vice versa for far spatial distance (Fujita et al., 2006; Henderson et al., 2006). As per CLT hypotheses, spatially close events (e.g., those occurring in an individual's town) are proposed to engage low-level construals, perceiving *how* an individual would act, with far spatially far events (those happening to the entire country or in another town) displaying the opposite (high-level construals and perceiving *why* actions).

To explain further, a study was conducted by Fujita et al. (2006) to test the effect of spatial distance on decision-making. Sixty-eight participants were recruited from New York University and were randomly assigned to one of two conditions. Participants were asked to imagine a scenario in which they were helping a friend move either “outside of New York, 3 miles away” (spatially near) or “outside of Los Angeles, 3,000 miles away” (spatially far). Participants were then asked to imagine performing behaviours related to the event by reviewing 13 behaviours and choosing which alternative they preferred. One choice described behaviour in terms of *how* it was performed, and the other described it in terms of *why* it was performed. For example, locking a door, the two options would be “putting a key in a lock” (how it is performed) compared to “securing the house” (why it is performed) (Fujita et al., 2006). Results supported CLT predictions and found that those who imagined the event as spatially distant preferred high-level (abstract and *why*) action identifications. This suggests that participants used high-level construals to represent events occurring in spatially remote locations and that increasing an event's spatial distance leads individuals to consider them more abstractly and globally (Fujita et al., 2006), thus potentially inhibiting behaviour.

To a context-specific example, climate change campaigns may include images of dying polar bears to signify the adverse effects of human-caused climate change. However, a polar bear is not directly visible to those living in, for instance, tropical North Queensland, Australia and therefore does not hold a great significance to these individuals. This is as opposed to a drought that impacts an individual’s hometown. This event is considered spatially ‘close’ compared to the polar bear example, to those living in areas prone to dry conditions, and thus the individual is more likely to be directly exposed to the problem presented. The association between water-saving and climate change is argued to be relatively abstract compared to specific pro-environmental behaviours (e.g., those engaged when in a drought) (Deng et al., 2017). The study outlined above conducted by Milfont et al. (2014) also supports the spatial distance argument in the environmental context. These results may suggest that decreased spatial distance to an event may positively influence mitigation behaviour in this context and thus should be explored further in the water-security context.

7.1.3 Social Distance

Social distance is the measure of similarity between social groups or individuals. This distance refers to how individuals feel within a group and interact with other groups/group members. Close social distance would be when a group feels they are similar to another individual or group. Far social distance is when an individual/group feels different from another (Liviatan et al., 2008). This psychological distance is based on the premise that those perceived to be more similar or have interpersonal similarity (i.e., close to an individual in terms of social distance) would be described more concretely (Liviatan et al., 2008).

To explain further, a study by Liviatan et al. (2008) examined whether participants represented another’s actions in concrete or abstract terms depending on their social distance. Researchers hypothesised that participants would prefer more superordinate actions, this being *how* an action is conducted or a concrete explanation, for those who were socially closer (Liviatan et al., 2008). Twenty-four undergraduate students at New York University participated in the study and were randomly assigned to similar or dissimilar conditions (based on classes taken at their university). Participants read information about the target individual and then completed a behavioural measure, which asked participants to make a choice about 19 behaviours performed by the target individual. One option described behaviour in terms of *how* it was performed, and the other described it in terms of *why* it was performed (Liviatan et al., 2008).

Results confirmed the hypothesis and found that those in the similar group had lower construal scores (i.e., high concrete construals/low abstract construals) (Liviatan et al., 2008). Participants identified activities performed by a similar target less in terms of their *why* terms than the same activities performed by those who were dissimilar. It may be expected that individuals would interpret information about closer individuals in terms of aspects central to them (e.g., their goals) rather than more secondary elements (e.g., the means to attain those goals). However, this finding indicates that greater levels of similarity result in perceivers forming lower level construals of others' actions (Liviatan et al., 2008) and again supports CLT's theoretical framework.

Given that environmental events affect many people, whether on a community or a global scale, the perceived effect by individuals, in terms of social distance, could be assumed to be quite variable. This is due to environmental events affecting everyone differently, such as property damage or finances. In this context, and as per CLT hypotheses, those experiencing an event with others in their social proximity would likely be engaged in low-level construals and perceiving *how* actions, with those feeling disconnected socially from others in terms of their environmental experience displaying the opposite (high-level construals and perceiving *why* actions). In the environmental context, social distance can be referred to as whether an individual is part of a group or collective experiencing (or not) a similar or the same environmental event – this premise is also worth exploring in the water-security context.

7.1.4 Hypothetical Distance

Last, hypothetical distance refers to the likelihood of an event occurring, with a hypothetically close event perceived to be likely to occur and unlikely to occur for those that are hypothetically far (Wakslak et al., 2006). This component builds on the premise of CLT itself and addresses why distant events are perceived more abstractly. Hypothetical distance, therefore, refers to the relationship between direct experience and knowledge about a particular event as well as probability and abstraction. When something is perceived to be more likely to occur to the individual, it would be approached with concrete processing (Wakslak et al., 2006).

Environmental risks can be considered large in terms of the risk it presents to many people. In the environmental context, much of the communication about environmental threats are hypothetical with future events and their likelihood always coupled with a degree of uncertainty (Spence, Poortinga, & Pidgeon, 2011), as discussed in chapter 3. Therefore, it could also be argued that environmental risks are greater in terms of hypothetical distance, as a whole, compared to road safety risks and risks to one's health. As per CLT hypotheses, those perceiving an event would likely occur would be hypothesised to be engaged in low-level construals and perceiving *how* actions, with those perceiving an event unlikely to occur engaged in the opposite (high-level construals and perceiving *why* actions).

7.2 The CLT, Environmental Threats and Behaviour

The use of CLT has been minimal in the environmental context, however, the research that has been conducted so far supports its use and justifies further investigation. For example, Spence, Poortinga and Pidgeon (2011) explored and characterised each of CLT psychological distances (temporal, social, spatial and hypothetical) in relation to climate change. Researchers suggested that climate change is perceived to be psychologically distant to many people, which could be the reason for increased levels of awareness, declining concern, and increased uncertainty and scepticism (Spence, Poortinga, & Pidgeon, 2011). Spence, Poortinga and Pidgeon (2011) argued (in support of Milfont (2010)) that climate change is perceived as psychologically distant on all CLT dimensions. The study aimed to determine if reducing the psychological distance of climate change risk is useful in promoting sustainable behaviour. The study recruited a nationally representative sample from Great Britain (*N*= 1,822). Participants completed a thirty-minute interview-style survey that asked questions regarding cognitive constructs relating to energy and climate change, behavioural intentions, perceptions of climate change and psychological distance dimensions (Spence, Poortinga, & Pidgeon, 2011).

Results indicated that lower psychological distance was related to greater concern about climate change. Findings also suggested that the sample believed that climate change is psychologically close, which contrasts with previous research (e.g., Milfont, 2010), and that its effects are already being experienced. The results also showed a relationship between the four psychological distances (temporal, social, spatial and hypothetical), with researchers indicating that one overarching measure for assessing psychological distance may be useful in the future (Spence, Poortinga, & Pidgeon, 2011), with no need to split into separate measures for assessing the four dimensions. This research supports the suggestion that CLT psychological distances require further investigation in the environmental context. It should be noted that this research was based on the large and broad issue of climate change, and it would be useful to examine whether the findings were consistent with local environmental threats.

Pertinent to the current study, research by Deng et al. (2017) applied CLT to the context of water security in their study with 488 Chinese high-school students who lived in a drought-prone area. Participants were surveyed on their drought experience, perceptions of specific water-saving behaviour and knowledge, as well as perceptions of climate change in the dimensions of perceived vulnerability, concern, belief, perceived connections between droughts and climate change, and their self-efficacy and adaptive behaviours. The researchers were interested in the mechanisms that increase individuals' adaptive behaviour in the water-security context and in understanding the extent to which the experience of extreme climatic events influences local drought adaptation behaviour (Deng et al., 2017). This study used Structural Equation Modelling to explore the driving factors and mechanisms that prompted behaviours in this context. Following CLT, two latent variables were estimated: perception of climate change (high-level construal) and perceptions of water-saving (low-level construal) (Deng et al., 2017).

Results found concrete perception of saving water (i.e., the event is perceived as proximal) plays a more significant part than an abstract perception of climate change in engaging in specific adaptive water-saving behaviours. The author's concluded that improving public perceptions of climate change might increase the desirability (the *why)* of adaptation, whereas improving perceptions of water saving might increase the feasibility (the *how*) of implementing adaptive measures (Deng et al., 2017). Whilst the study established an important connection between localised disasters and climate change, there were considerable limitations. First, the sample was comprised of high-school students, thus limiting the generalisability of the study's findings. Next was the use of a cross-sectional methodology, which limits internal validity. As the outcome (reported behaviour) and exposure to the threat (experiences of drought) were measured at the same time, no assumptions can be made about the exposure causing the outcome. To put it another way, the outcome cannot be attributed to the exposure of the questions about drought and climate change, particularly given that the two dimensions assessed (i.e., low vs. high-level construals or climate change vs. specific water-saving behaviour) presented the different perceptions of related events. Additionally, the study by Deng et al. (2017) did not explicitly examine the individual components of CLT (i.e., the social, temporal, hypothetical and spatial psychological distances), thus arguably not investigating the true utility of the theory in the water security context. While promising that

CLT has been applied in the water-security context, these considerations are of key interest to the current study, which also applies CLT to a localised water-related event.

CLT is a relatively new theoretical concept attempting to explain the effect of psychological distance on individual perception and evaluation (Liberman & Trope, 1998; Trope & Liberman, 2003, 2010). The original research investigating CLT was predominately undertaken by the researchers who developed the theoretical concept itself (e.g., Fujita et al., 2006; Henderson et al., 2006; Liberman & Trope, 1998; Liviatan et al., 2008; Nussbaum et al., 2003; Wakslak et al., 2006). These studies were also predominantly focused on mundane, ordinary events (e.g., going on a camping trip) that do not contain a natural and un-fabricated threat (e.g., a natural disaster which is naturally occurring and not created), as suggested with environmental threats (e.g., Fujita et al., 2006; Liviatan et al., 2008; Nussbaum et al., 2003). Many studies use this theory, with the majority demonstrating the underlying mechanisms' effect on decision-making (e.g., Fujita et al., 2006; Henderson et al., 2006; Liberman & Trope, 1998; Liviatan et al., 2008; Nussbaum et al., 2003; Wakslak et al., 2006). However, using CLT in other contexts, with larger, more diverse samples and an inherently threatening event, may be useful in examining this theory's utility, depth, and robustness. Additionally, using this theory to further explore and analyse an individual’s threat perceptions in the water security context may provide further recommendations for communication strategies to increase behavioural engagement in this space.

7.3 Current Study

Previous chapters have highlighted the variability of individual threat perceptions in the water security context. For instance, in Study 1, individuals were all exposed to the same drought, yet their perceptions of the issue differed, and so did their behaviour. Whilst it was established that threat and efficacy perceptions played some role in predicting individual behavioural compliance, the extent to which is not well understood.

There is evidence to suggest that threat perceptions (and thus behaviour) are influenced by psychological distance in other contexts (e.g., Hatchell et al., 2013; Rigby et al., 1989; Ross et al., 1990; Shanahan et al., 2000), in that increased psychological distance results in lower threat perceptions. Relationships between psychological distance, threat perceptions and behaviour have also been explored in the broader context of climate change, where it has been found that estimates of threat susceptibility to climate change were not a predictor of the performance of environmental mitigation behaviour (Kim et al., 2013).

Similarly, and when considering communication, research has also indicated that individuals find climate change to be an important and concerning issue but disempowering on a personal level, in that the effects are widespread and perceived as uncontrollable (O'Neill & Nicholson-Cole, 2009). Specifically, O'Neill and Nicholson-Cole (2009) found that the most engaging images of climate change were those that the participants felt they could personally relate to, and the more iconic images used in communication have been said to lack personal relevance and thus are not engaging. In the water security context, the importance of perceived personal relevance was also recognised by Manning et al. (2013) in their assessment of the communication materials used for a local government water conservation initiative - the TCC Dry Tropics Water Smart program. Manning et al. (2013) found that individuals who did not personally relate to the images included in posters were less likely to exhibit behavioural engagement. These findings suggest that the degree to which a viewer perceives an image as being personally relevant can influence their cognitive or behavioural engagement level. Although these two examples are primarily based on communication imagery and do not explicitly address the concept of psychological distance, much is left to be said about an environmental event, and the influence personal relevance or salience of an issue has on individual decision-making in this context. It could be argued that personal relevance or salience is largely influenced by the perceived psychological distance of the imagery and may have affected engagement in these instances. Thus, the question of what impact psychological distance has on individual threat perceptions and behaviour in the water security context needs to be further explored.

The communication of uncertain environmental events may be improved by further understanding how this uncertainty influences environmental-related decisions. The current study will further examine the construct of ‘threat’ and its relationship to behaviour in the water security context. It will also attempt to understand the influence of psychological distance in this context by examining how the four factors of temporal, spatial, social, and hypothetical distance influence decision-making, which is currently unclear in the environmental literature. Understanding the effect of perceived distance is proposed to allow for a more accurate exploration of individual threat perceptions in this context. This study may also offer additional information to develop effective communication strategies and encourage water conservation behaviour.

Chapter 8: Study 2 - The Influence of Psychological Distance on Threat Perceptions in the Water Security Context

8.1 Study Hypotheses

Three hypotheses relating to Study 2 were developed. These were based on the literature discussed so far in this thesis and also the results found and discussed in Study 1. Previous research has highlighted the influence and effects psychological distance has on an individual's concern, willingness to cooperate and the likelihood of behaving in a particular manner (e.g., Fujita et al., 2006; Liviatan et al., 2008; Nussbaum et al., 2003; Wakslak et al., 2006). Such research has used the CLT as a basis for enquiry (Trope & Liberman, 2010). In the broader environmental context, there has been minimal application of CLT to investigate the effect of psychological distance (e.g., Kortenkamp & Moore, 2006; Milfont et al., 2014). To date, only one study has used the model in the water-security context (Deng et al., 2017), with much left to be explored with regard to the specific components of CLT (i.e., the spatial, temporal, hypothetical and social factors).

Given environmental threats, specifically, those related to water, are often communicated with a degree of uncertainty, are 'distant' as they usually occur at some point in the future and have been shown to be less personally relevant due to this distance (Mankad et al., 2013; O'Neill & Nicholson-Cole, 2009; Spence, Poortinga, & Pidgeon, 2011), conducting research in this context is vital given the increasing concern of water security and supply for Australia. Exploring the similarities and differences between perceptions of proximal and distal threats may also generate a greater understanding of the threat construct in the environmental context, particularly in the area of water security. Therefore, the following hypothesis was established:

Hypothesis 1: *Individuals' perceptions of threat susceptibility, threat severity, self-efficacy and response-efficacy would change after exposure to messages containing proximal or distal events.*

As an extension of Hypothesis 1, and based on previous literature (Haney, 2021; Milfont et al., 2014; Spence, Poortinga, Butler, et al., 2011), the effect of prior experience of environmental events on behaviour was also of interest. In these studies, it was found that those who did perceive they had experienced a threat to their water security had higher threat severity and susceptibility perceptions than those who did not feel they experienced a water security threat (Haney, 2021; Milfont et al., 2014; Spence, Poortinga, Butler, et al., 2011).

Furthermore, as found in Study 1 with a sample currently experiencing a threat to their water security, exposure to such events does not necessarily translate to increased threat perceptions and behaviour. Given the context of the current thesis and the objective to provide recommendations for communications that will improve water conservation behaviour, this result warranted further exploration. It is evident that experiencing a major environmental event and perceiving that event as threatening are two different things. This may also affect threat perceptions when an event is perceived as psychologically distant. Therefore, the following hypothesis was established that examines the interplay between previous experience and perceived threat:

Hypothesis 2: *It was expected that individuals who did perceive they had experienced a recent threat to their water security would have greater threat perceptions (susceptibility and severity) compared to those who did not.*

To extend the exploration and discussion of CLT in the water security context, it is imperative to understand what kind of thinking an individual engages in when exposed to a threat. Abstract thinking/thoughts, or high-level construals, consist of broad, goal-irrelevant, simple, de-contextualised features that convey the "essence" of future events (Trope &

Liberman, 2003). Alternatively, concrete thinking or low-level construals are contextual, goal-relevant and contain incidental details (Trope & Liberman, 2003). In terms of outcomes, high-level construals are hypothesised to employ actions that address *why* individuals act in a particular manner, as opposed to low-level construals hypothesised to employ actions that address *how* individuals act (Trope & Liberman, 2003). Evaluating and exploring individual decision-making and how people process uncertain, distant, or hypothetical information (in terms of *how* or *why*) will allow a more in-depth understanding of the perception of and response to threat information. This is particularly important in the environmental context, where the relationship between threat and behaviour is somewhat unclear and ambiguous. Therefore, the following hypothesis was established for this study:

Hypothesis 3: *Individuals will choose the behaviour that is aligned with the "why" line of thinking when exposed to a "far" event and the "how" line of thinking when exposed to a "close" event.*

Other exploratory analyses were also conducted to establish more of an understanding of the context in which decisions were made, and to further understand the utility of CLT in the water security context, specifically which types of psychological distance were most influential for decision making. Hypotheses were not made for these analyses as they were exploratory.

8.2 Study Context

Townsville was chosen as the location of the study given the unique water security events the region had just recently faced, making the exploration of threat perceptions in this context novel. To provide more detail, following the drought period experienced in Townsville outlined in chapter 4, Townsville experienced considerable rainfall, resulting in the Ross River Dam level rising from 60 to 100% between February 2018 and February 2019. In February 2019, an unprecedented rainfall event resulting in a catastrophic flood occurred in

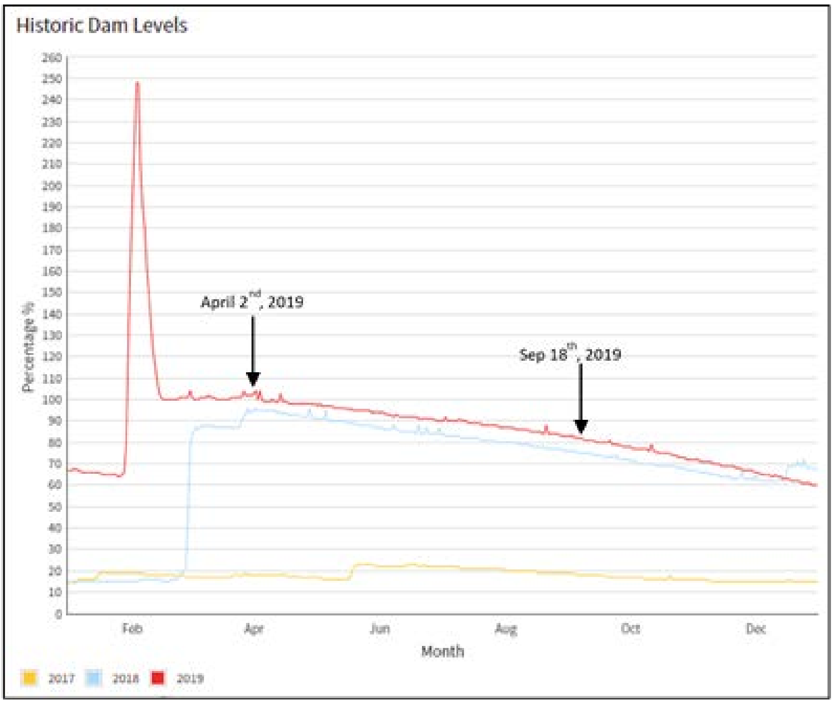
Townsville, which had significant social, human, economic, and infrastructural impacts on the region. Within days, the Ross River Dam reached almost 250% capacity. This event fell inside this region's usual wet season (November to April). On the 17th of March 2019, Townsville's water restrictions eased to modified Level 2 restrictions:

- Sprinklers only to be used between 6-8 pm, two days per week
- Handheld watering anytime
- Bucket or water-efficient car wash to wash vehicles and boats

These restrictions remained active whilst the data collection for the current study occurred (April 2nd 2019, to September 18th 2019). See Figure 11for Ross River Dam level (%) from 2017 until 2019.

Figure 11

Ross River Dam Levels (%) from 2017-2019 (Townsville City Council, 2022)



Note. Retrieved from TCC website: https://www.townsville.qld.gov.au/water-waste-and-environment/water-supply-and-dams/dam-levels

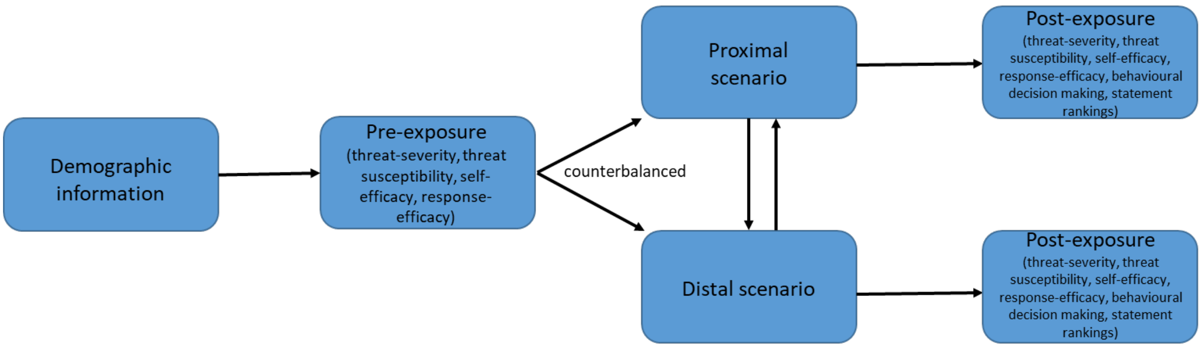
8.3 Method

8.3.1 Study Design

The study was a pre-post experimental design that examined a series of variables at baseline and after exposure to two scenarios. One scenario described a water-related event that was psychologically far (distal), and the other described a water-related event that was psychologically close (proximal). Both events in the scenarios were described in terms of social, temporal, spatial and hypothetical distance to mimic real-life scenarios. Participants viewed both proximal and distal scenarios, with the order of presentation randomly counterbalanced across participants to avoid confounding. An overview of the study design is illustrated in Figure 12.

Figure 12

Flow Diagram of Study 2 Design



First, all participants completed demographic questions, followed by the pre-exposure questions that assessed participants' threat susceptibility, threat severity, response-efficacy, and self-efficacy perceptions in response to the current water security issue/s in Townsville. These questions were asked to provide a baseline assessment of these variables. Participants were then shown one of the scenarios and asked to imagine they were experiencing the described situation. After viewing the first scenario, participants responded to questions about threat severity and susceptibility, self-and response-efficacy, behavioural decision-making, and CLT dimension statement rankings. Participants then viewed the second scenario and completed the same measures as completed after viewing the first scenario. The measures and the scenarios are described in more depth below.

8.3.2 Participants

A total of 499 individuals engaged in the study. Surveys that were less than 30% complete or if participants selected that they "*Did not agree*" to participate were removed. After further inspection of the data, there was substantial missing data across baseline items. As the baseline measures were some of the main variables of interest, cases with less than half (under 8) of the sixteen demographic and baseline measurement questions (threat and efficacy measures) completed were excluded from the analysis (n=81). Furthermore, 119 participants were excluded from this sample as they did not identify as residents of Townsville, North Queensland, Australia. On this basis, the final sample consisted of 299 participants (205 women, 93 men and one individual not indicating a gender), ranging in age from 17 to 65 years (M= 25.12, SD= 10.61). Most participants indicated they did not own a home (n= 241) and that they had experienced a water security issue (e.g., their town had been drought declared or experienced a catastrophic flood) (n= 233).

8.3.3 Materials

A 41-item online survey was developed for this study. The full version of the survey can be found in Appendix I. The materials included two fictional vignettes (the scenarios), one for each condition (distal and proximal). After vignette exposure, the questions in the survey asked of participants were based on the EPPM variables (perceived self-efficacy, response-efficacy, threat severity and threat susceptibility), decision-making/behavioural choice questions, and CLT statement rankings.

The vignette for the proximal scenario was a description of the participant's current city or town that was hypothetically experiencing an event that was "close" in terms of hypothetical, temporal, social and spatial distance from the individual reading it (as guided by CLT (Trope & Liberman, 2010)). As all non-Townsville respondents were removed for the purpose of this thesis, the city or town presented in the proximal scenario was always Townsville. For the distal scenario, the vignette was much broader in context. This scenario was about Australia experiencing an event that was “far” in terms of hypothetical, temporal, social and spatial distance from the individual reading it. Table 20 shows the breakdown of each vignette according to CLT factors.

Note, for the temporal distance statement, the timeframes chosen (four years and 12 months) were relative to the area (i.e., Townsville and Australia). It would be unlikely that the whole of Australia would not experience rain for over four years. Thus, the timeframe of 12 months was chosen for the distal scenario. This timeframe (four years) would be more likely for a small geographical area like Townsville, thus the reason for this choice for the proximal scenario. Additionally, Townsville had recently experienced a drought that spanned over four years (from 2015 until 2019) before the data collection for this study, again emphasising the likelihood of this occurring in the region.

Table 20

Breakdown of Vignettes According to CLT

CLT factor (distance)	Proximal Scenario	Distal Scenario
Spatial	*Townsville is experiencing a major water security issue*	*Currently Australia is experiencing a major water security issue*
Social	*Townsville is the only community experiencing water insecurity to this degree in Australia*	*Australia is not the only country experiencing water insecurity in the world*
Temporal	*Townsville has not experienced substantial rain in over 4 years*	*Australia, overall, has not experienced substantial rain in over 12 months*
Hypothetical	*It is predicted that Townsville will remain on water restrictions for a substantial period*	*It is predicted that Australia will experience many negative effects as a result of this water security issue (for example, mass soil erosion)*

8.3.4 Measures

Only measures used for analyses in the current thesis have been described below. See Appendix I for the entire questionnaire.

Demographics. Demographic data, including gender, age, homeownership and water security experience (*"Have you ever experienced water security issues (for example, has a town you have lived in/are currently living in, been drought declared, was the local dam at a low capacity, etc.)?"*), was collected.

Threat susceptibility. Threat susceptibility was defined as an individual's perception of how likely the threat will impact the individual (Witte, 1992). Given the arguments presented about the global impact of environmental events, this definition was also applied to bodies external to the individual (i.e., their family/friends, Townsville, and Australia). Participants were asked to indicate how much they thought the negative impacts of water security described in the scenarios (mass soil erosion, decrease in pond/dam levels and shortage in stock production) were likely to affect themselves, their friends and family, people in their current city/town, their current city/town (economically/environmentally), people nationally within Australia, and Australia (economically/environmentally). These six items were rated on a 7-point Likert Scale (1= *not likely at all* to 7= *extremely likely*). The same set of six questions were used for the pre-test and after the presentation of both scenarios. Question scores were averaged to give each individual one threat susceptibility score between one and seven, as per the original response scale. Higher scores indicated higher threat susceptibility perceptions. All threat susceptibility measures had a Cronbach alpha value of .80 or above, showing good internal consistency.

Threat severity. Threat severity was defined as the perception of how much harm the event/stimulus can cause to the individual (Witte, 1992). Like above, given the arguments presented about the global impact of environmental events, this definition was also applied to bodies external to the individual (i.e., their family/friends, Townsville, and Australia). Participants were asked to indicate how much they thought the negative effects of water security described in the scenarios would negatively impact themselves, their friends and family, people in their current city/town, their current city/town (economically/environmentally), people nationally within Australia, and Australia (economically/environmentally). These six items were rated on a 7-point Likert Scale (1= *no effect* to 7= *extreme effect*). The same set of six questions were used for the pre-test and after exposure to both scenarios. Question scores were averaged to give each individual one threat severity score between one and seven, as per the original response scale. Higher scores indicated higher threat severity perceptions. All threat severity measures had a Cronbach alpha value of .80 or above indicating good internal consistency.

Decision-making/behavioural choices. Participants were presented with six behavioural choice questions and were forced to choose between one of two response options relating to the how or why of completing that behaviour. For example, "*The local council has provided each household with a shower timer as a water saving initiative*". Option 1 (How): "*You put the shower timer in your bathroom to see how long your usual showers take*". Option 2 (Why): "*You set the time so you take shorter showers to conserve water*". Participants were provided with both options and asked to indicate whether they engaged in the *how* or *why* line of thinking. This question development was based on the same logic used in the studies conducted by Fujita et al. (2006) and Liviatan et al. (2008) described in chapter 7. Two questions for each scenario had the *how* and *why* options presented in the opposite order to maximise internal validity (i.e., the *why* option was presented first, instead of *how*). Choices for these questions were re-coded before analysis to be coded in the same direction as other questions in this pool, with a total *how* and *why* score given to each participant for each scenario presentation that ranged between one and six. The percentage of responses to the *how* or *why* categories were recorded for each participant.

Self-efficacy. Self-efficacy was defined as whether individuals perceived they could minimise a perceived threat (Witte, 1992). Before reading the scenarios, participants were asked to rate their agreement with four items using a 7-point Likert Scale (1= *strongly disagree* to 7= *strongly agree*). Questions such as "*I have access to the tools and assistance I need to help minimise the stress on the water supply in Australia*" were used to assess an individual's perceived self-efficacy. Question scores were averaged to give each individual one self-efficacy score between one and seven, as per the original response scale. Higher scores indicated higher self-efficacy perceptions. Self-efficacy measures in the pre-test survey had a Cronbach alpha value of .80 or above showing good internal consistency.

After the presentation of each of the two scenarios, the participant's self-efficacy was assessed using one question. The four questions used in the pre-exposure question pool were not used in post-exposure due to the potential of response bias. Participants were first presented with their chosen behaviours from the decision-making/behavioural choices questions illustrated above. For example, if participants chose "*The local council has provided each household with a shower timer as a water saving initiative*" (the *how* option), then this choice would be shown to them again, and the following questions regarding self-efficacy would be related to those behaviours. To measure self-efficacy, participants were then asked, *"How likely do you think you would actually engage in the behaviours you chose above, to assist with a water security issue in your city/town/community"* using a 7-point Likert Scale (1= *extremely likely* to 7= *extremely unlikely*), with scores being reverse coded for the analysis and higher scores indicating higher self-efficacy perceptions.

Response-efficacy. Response efficacy was defined as whether individuals perceived the action they took to minimise a perceived threat was effective (Witte, 1992). Before reading the scenarios, participants were asked to rate their agreement with four items on a 7-point Likert Scale (1= *strongly disagree* to 7= *strongly agree*). Questions such as "*I believe my current efforts will help minimise the stress to the water supply in Australia*" were used to assess an individual's perceived response-efficacy. Question scores were averaged to give each participant one response-efficacy perception score. Scores ranged between one and seven, as per the original response scale. Higher scores indicated higher response-efficacy perceptions. Response-efficacy measures in the pre-test survey had a Cronbach alpha value of 0.76, indicating good internal consistency.

After the presentation of each of the two scenarios, the participant's response-efficacy was assessed using one question. The four questions used in the pre-exposure question pool were not used in post-exposure due to the potential of response bias. Participants were first presented with their behaviours in the decision-making/behavioural choices questions illustrated above. For example, as with self-efficacy if participants chose "*The local council has provided each household with a shower timer as a water saving initiative*" (the *how* option), then this choice would be shown to them again, and the following questions regarding response-efficacy would be related to those behaviours. To measure response-efficacy, participants were then asked, "*How likely do you think your engagement in these behaviours would minimise the impact of water insecurity in your city/town/community*?" using a 7-point Likert Scale (1= *extremely likely* to 7= *extremely unlikely*), with scores being reverse coded for the analysis and higher scores indicating higher response-efficacy perceptions.

Statement rankings. Participants were asked to rank the four CLT factor statements shown in vignettes (the spatial, temporal, social and hypothetical statements as described in Table 20 above), with '1' being the *most influential/important* and '4' being the *least influential/important* regarding their responses to the decision making/behavioural choice questions. For example, if participants chose "*The local council has provided each household with a shower timer as a water saving initiative*" (the *how* option), then this choice would be shown to them again, and the ranking would be in response to those chosen behaviours. Participants were asked to rank, in order of influence, which CLT statements (spatial, temporal, social and hypothetical) were the most influential in making those behavioural choices.

8.3.5 Procedure

Ethical approval for this study was obtained through the James Cook University Ethics Committee (Ethics approval H7675) (see Appendix J). Recruitment sites included online social media networks (Twitter and Facebook) and university and community networks via local radio stations and the James Cook University Psychology Research Participation pool using the SONA system. Participants were presented with a URL where they could find and complete the questionnaire via the Qualtrics (Provo, UT) online platform. All participants read an information sheet and indicated their consent to participate in the study (see Appendix K for the information sheet). Active consent was obtained by participants agreeing to participate in the questionnaire by clicking "*AGREE*". Upon completing the survey, the participants were thanked for their time and awarded course credit where applicable. Non-university students did not receive compensation for their participation in the study. The survey took approximately 20 minutes to complete and was active from April 2nd 2019, until September 18th 2019.

8.3.6 Data Treatment and Analysis

The data were downloaded from the Qualtrics (Provo, UT) platform, and all data management and statistical analyses were performed using the IBM SPSS software Version 27. Repeated measures ANOVAs were conducted to measure the main effects of scenario exposure (three levels: baseline vs. after proximal scenario exposure vs. after distal scenario exposure) on all EPPM variables. Independent samples *t*-tests were conducted to compare means for threat severity and susceptibility perceptions based on threat experience. A two-way repeated-measures ANOVA was conducted to measure the differences in threat perceptions at baseline, after proximal and distal scenario exposure for those who did perceive they had experienced a threat to their water security and those who had not. Furthermore, a series of exploratory analyses were conducted on the statement ranking data.

8.4 Results

Hypothesis one predicted that individuals' perceptions of threat susceptibility, threat severity, self-efficacy and response-efficacy would differ between scenario conditions (pre-exposure and post-exposure for the proximal and distal scenarios). Table 21 outlines the means (SDs) for the EPPM variables for each condition.

For the EPPM variables in the pre-exposure phase, participants reported neutral ratings of perceived threat susceptibility, threat severity, and neutral to high ratings of self-efficacy and response-efficacy. Participants again reported neutral threat susceptibility and severity ratings in the proximal scenario and marginally higher self-efficacy and response-efficacy ratings than the pre-exposure data. Participants reported marginally higher ratings (compared to the pre-exposure and proximal scenario) for threat susceptibility and threat severity perceptions and neutral to high ratings of self-efficacy and response-efficacy after the distal scenario presentation.

Table 21

Mean (SD) of EPPM Variables for Each Condition

Variable	Pre-exposure	Post-exposure Proximal	Post-exposure Distal
		M (SD)	
Threat susceptibility	4.44 (1.21)	4.47 (1.21)	5.04 (1.17)
Threat severity	4.26 (1.28)	4.15 (1.31)	4.96 (1.22)
Self-efficacy	5.31 (0.99)	5.87 (0.96)	5.89 (0.96)
Response efficacy	5.02 (1.02)	5.25 (1.30)	5.26 (1.29)

Repeated measures ANOVAs were conducted between the three condition scores on all EPPM variables to assess if scenario presentation altered threat and efficacy perceptions.

First, the relevant assumptions were assessed. The dependent variables were measured on a continuous level, and the independent variable had two or more groups (three) and no significant outliers. Additionally, the distribution of the dependent variables were normally distributed. For the threat variables, the sphericity assumption was violated given the Mauchly's test significance values were less than .05 for threat susceptibility ($\chi^2_{(2)} = .97$, $p = .007$) and threat severity ($\chi^2_{(2)} = .96$, $p = .004$) between all three scores (pre-exposure, proximal scenario and distal scenario). Because of this significant finding, the Greenhouse-Geisser correction was applied. The Greenhouse-Geisser value was greater than .75 for threat susceptibility (.97) and threat severity (.97). As a result, the Huynh-Feldt correction was used.

Results indicated that the sample had significantly different threat susceptibility perceptions between pre-exposure and after exposure to the proximal and distal scenarios ($F_{(1.95, 542.95)} = 38.78$, $p < .01$). Additionally, the sample had significantly different threat severity perceptions between the pre-exposure and after exposure to the proximal and distal scenario ($F_{(1.94, 541.12)} = 59.67$, $p < .01$). Post-hoc analyses were conducted using a Bonferroni adjustment. There was a significant difference between means for the pre-exposure and distal scenarios, and the proximal and distal scenarios (all *ps* <.01) for threat susceptibility and severity. The distal scenario presentation resulted in the highest threat perceptions. No significant differences were found between the pre-exposure and proximal scenario for either variable (*p*'s > 0.05).

For efficacy variables the assumption of sphericity was violated given the significance of the Mauchly's test values were less than .05 for self-efficacy ($\chi^2_{(2)} = .89$, $p < .001$) and response-efficacy ($\chi^2_{(2)} = .96$, $p = .002$) between all three scores (pre-exposure, proximal scenario and distal scenario). Because of this significant finding, the Greenhouse-Geisser correction was applied. The Greenhouse-Geisser value was greater than .75 for self-efficacy (.90) and response-efficacy (.96). As a result, the Huynh-Feldt correction was used.

Results indicated that the sample had significantly different self-efficacy perceptions between pre-exposure and after exposure to the proximal and distal scenarios ($F_{(1.81, 509.17)} = 53.04$, $p < .01$). Additionally, the sample had significantly different response-efficacy perceptions between the pre-exposure and after exposure to the proximal and distal scenarios ($F_{(1.93, 531.78)} = 6.50$, $p = .002$). Post-hoc analyses were conducted using a Bonferroni adjustment. There was a significant difference between means for the pre-exposure and proximal scenarios and the pre-exposure and distal scenarios (all *ps*<.01) for both perceived self-efficacy and response-efficacy. The distal scenario presentation resulted in the highest self-efficacy and response-efficacy perceptions. No significant difference was observed between proximal and distal scenarios for either efficacy variable (*p*s > .05).

Hypothesis two predicted that those with perceived water security threat experience would have greater threat susceptibility and severity perceptions compared to those with no experience. First, an independent samples *t*-test was conducted to compare baseline threat severity and susceptibility perceptions between those who perceived a threat to water security and those who did not. The relevant assumptions were first assessed. There were no significant outliers, and the assumptions of homogeneity and normality were satisfied. Results indicated that there was a significant difference between groups for baseline threat severity ($t_{(297)} = 4.53$, $p < .01$) and threat susceptibility ($t_{(297)} = 2.76$, $p < .01$), with those who perceived they had experienced a threat to water security reporting significantly higher threat severity and susceptibility perceptions at baseline (see Table 22).

A two-way repeated-measures ANOVA was conducted to measure differences in threat perceptions after proximal and distal scenario exposure for those who perceived they had experienced a threat to their water security and those who had not. First, threat severity was analysed, and results showed there was a significant main effect of scenario exposure for participants' threat severity scores ($F_{(1, 278)} = 56.84$, $p < .01$), with the distal scenario exposure increasing threat severity perceptions for both groups. There was a non-significant main effect of perceived experience on individual threat severity scores ($F_{(1, 278)} = 3.76$, $p = .054$). There was also no significant interaction between scenario and perceived experience ($F_{(1, 278)} = 1.25$, $p = .27$). Refer to Table 22 for means and standard deviations for relevant variables.

The same analysis was also conducted for threat susceptibility. The analysis showed there was a significant main effect of scenario exposure for participants' threat susceptibility scores ($F_{(1, 278)} = 27.16$, $p < .01$), with the distal scenario exposure increasing threat susceptibility perceptions for both groups. There was also a significant main effect of experience on individual threat susceptibility scores ($F_{(1, 278)} = 7.42$, $p = .01$), with lower threat susceptibility scores shown for those who did not perceive they had experienced a threat to their water security. There was no significant interaction between scenario and perceived experience ($F_{(1, 278)} = 1.96$, $p = .16$). Refer to Table 22 for means and standard deviations for relevant variables.

Table 22

Mean (SD) for Threat Variables for Each Scenario for Each Experience Group

Threat variable	Scenario	Perceived experience (*n*= 233)	No perceived experience (*n*= 66)
		M (*SD*)	
Threat severity	Baseline	4.34 (1.27)	3.84 (1.41)
	Proximal	4.20 (1.29)	4.01 (1.37)
	Distal	5.05 (1.25)	4.65 (1.09)
Threat susceptibility	Baseline	4.61 (1.16)	3.86 (1.25)
	Proximal	4.52 (1.17)	4.28 (1.31)
	Distal	5.16 (1.14)	4.65 (1.19)

Hypothesis three predicted that individuals would choose the behaviour aligned with the *why* line of thinking when exposed to the distal scenario and the *how* line of thinking when exposed to the proximal scenario. As shown in Table 23 and Table 24, it appears that regardless of the scenario, the sample was more likely to choose the *how* line of thinking when making a decision about behaviour.

Table 23

Frequency of 'How' and 'Why' Response Choices for Proximal Scenario

Statement	Why	How
	n (%)	
1: Imagine that water restrictions are now enforced in your local community. Monetary penalties apply for non-compliance. These restrictions limits lawn watering to only twice per week.	97 (34)	188 (66)
2: You need a new shower head. The sales assistant at your local bathroom store had recommended a particular water saving shower head.	85 (30)	201 (70)
3: Washing driveways with a hose is not currently allowed under the new water restrictions. You see your neighbour washing their driveway with a hose.	116 (41)	169 (59)
4: The local council has provided each household with a shower time as a water-saving initiative.	75 (26)	211 (74)
5: Under the new restrictions, you are only allowed to use water-saving hose fittings.	98 (34)	188 (66)
6: The sale assistant at your local nursery has recommended you buy particular plants that are ideal for dry climates.	64 (22)	221 (78)

Table 24

Frequency of 'How' and 'Why' Response Choices for Distal Scenario

Statement	Why	How
	n (%)	
1: The Government has stated that the majority of the country's water supply is used to water lawns. It is recommended households only water their lawn 3 times per week. In the next couple of years, you may not be able to water your lawn at all.	60 (21)	222 (78)
2: You need a new shower head. The sales assistant at your local bathroom store had recommended a particular water saving shower head.	71 (25)	212 (75)
3: A pamphlet in the mail came from the State Government to tell residents that certain activities, such as washing driveways with a hose, wastes water. You see your neighbour washing their driveway with a hose.	102 (36)	180 (64)
4: You view a news report stating the positive effects to the country's water consumption by taking shorter showers every day. The news report recommends only showering for 4 minutes.	83 (29)	200 (71)
5: Your hose fittings are needing to be replaced. The only hose fittings now available at local hardware stores are those that are water-saving.	89 (31)	194 (69)
6: The sale assistant at your local nursery has recommended you buy particular plants that are ideal for dry climates.	70 (25)	213 (75)

Exploratory analyses were conducted on other variables and relationships of interest. Of interest to the research was how each CLT statement was ranked in terms of perceived influence and/or importance to decision making. Table 25 shows the rank position of each CLT statement from the proximal scenario. The spatial and temporal statements appeared to have been the most influential/important for the sample, given that most respondents put these statements in the first or second positions. This result is dissimilar to the social statement ranking, which was typically placed in the last position, and therefore considered the least influential/important to respondents. Additionally, the hypothetical statement was commonly put in the second, third or fourth position, indicating mixed influence or importance.

Table 25

Statement Ranking for Proximity Scenario

CLT factor (distance)	Position frequency (*n*)			
	1	2	3	4
Spatial	79	59	51	47
Social	51	41	50	94
Temporal	70	67	64	35
Hypothetical	36	69	71	60

Note. 1=*most influential/important*, 4=*least influential/important*

Table 26 shows the rank position of each CLT statement from the distal scenario. Table 26 shows again that the social statement was considered the least influential/important by most participants, as evidenced by most participants ranking it in the last position. The spatial statement appeared to be ranked evenly across the top three positions. In comparison, the hypothetical statement appeared to be almost evenly spaced across the first two rank positions, indicating its perceived influence or importance amongst respondents. The temporal statement appeared to be most commonly ranked in the third position, suggesting that it is perceived to be non-influential and unimportant to respondents.

Table 26

Statement Ranking for Distal Scenario

CLT factor (distance)	Position frequency (*n*)			
	1	2	3	4
Spatial	76	74	68	27
Social	37	26	38	144
Temporal	54	62	83	46
Hypothetical	78	83	56	28

Note. 1=*most influential/important*, 4=*least influential/important*

8.5 Discussion

The current study had two main objectives. The first was to explore the influence of psychological distance on threat perceptions in the water security context. The second was to further examine the utility of CLT in the water security context, to better understand threat perceptions. These objectives were explored with three hypotheses. The first hypothesis stated that individuals' perceptions of threat susceptibility, threat severity, self-efficacy and response-efficacy would differ between scenario exposure and pre-exposure data. The sample showed statistically significant differences in perceived threat severity and susceptibility at pre-exposure compared to perceptions after exposure to the distal scenario, and between proximal and distal scenarios. Exposure to the distal scenario resulted in higher threat susceptibility and severity perceptions than pre-exposure and after the proximal scenario. Additionally, it was found that there was no difference in threat perceptions between pre-exposure and after the proximal scenario. Therefore, the hypothesis was partially supported in relation to the distal but not the proximal scenario. It is worth noting that this study was conducted within a unique cohort who experienced major water security events in a relatively short time period. Therefore, generalisation of these results to other populations should be done with caution.

Previous research suggests that threat perceptions may be influenced by psychological distance in that a proximal event would result in higher individual concerns, and an individual would be more receptive to a proximal event than one that was distal (Deng et al., 2017; Scannell & Gifford, 2013; Spence, Poortinga, & Pidgeon, 2011). The current study results somewhat conflict with the research conducted by Scannell and Gifford (2013), who indicated that participants were more receptive to personally relevant messages or information about a local event than distant or global information. Additionally, and specific to the water security context, the results also conflict with the research conducted by Deng et al. (2017), whereby proximal events were more predictive of behaviour in participants experiencing drought.

A psychologically distant event is one that *may* occur at some point in the future, to others, and to areas outside of local residency. According to CLT, these reasons are presumed to be why such distance inhibits mitigation behaviour and does not elicit threat perceptions as much as proximal environmental events (Liberman et al., 2007). However, participants in the current study reported higher threat perceptions after exposure to the distal scenario, which was framed around an event that *may* occur and was further away in terms of psychological distance. The differing results between previous research and the current study can perhaps be explained by the unique experiences of the current study sample. These unique experiences (i.e., the recent occurrence of a catastrophic flood following a significant period of drought in the region) should be considered in all results for Study 2, given the disastrous effects it had on the community and also the timing of data collection.

To provide more context, within the timeframe of Study 2, Townsville experienced unique threats to water security. First, and as explained in Study 1, the region experienced an extensive drought period. Approximately one year later, the region had too much water (i.e., the 2019 flood). Despite the rainfall, water restrictions remained in place. With restrictions still in place, residents were now dealing with a water issue of a different kind, with expected behaviours (water restrictions) not synonymous with reality (i.e., a mass flood and a dam that was over-capacity). This paradox arguably undermined the critical nature of the water security issue at play for the community. The water threat changed in terms of type and severity, yet the behaviour was expected to remain relatively consistent.

The distal scenario may have been more threatening to the current sample given the wide-ranging effects described within this scenario, including mass soil erosion, a decrease in pond/dam levels and a shortage in stock production. In support of this finding, hypothetical distance statements, which presented information about these wide-ranging effects, were ranked as one of the most important/influential for decision-making after exposure to the distal scenario. This result may be due to this information being new or potentially concerning for respondents who were well aware and accustomed to the current water restrictions, which they had followed for some time. Outside of the region, several other negative impacts known to the residents of Townsville (given their geographical location and reliance on livestock and vegetable farming industries for economic support) may occur due to water security issues—for example, widespread agricultural loss (CSIRO, 2011). These other impacts may have been seen as more threatening than more local impacts, such as continued water restrictions.

Additionally, these threat perceptions may also be driven by past experience. Individuals in Townsville may be less concerned about the impacts of water insecurity on themselves, as they have experienced them before and perhaps feel they can control them. However, when these impacts start to affect the nation more widely (as depicted in the distal scenario), it may be perceived as more problematic. Greater distance resulting in higher threat perceptions aligns with the research conducted by Spence and Pidgeon (2010), where the framing of climate change impacts as distant resulted in these impacts being perceived as more severe. Researchers concluded that this result emphasises that climate change is a naturally psychologically distant phenomenon (Spence & Pidgeon, 2010). Perhaps it may be that water insecurity is considered a naturally distant phenomenon, like climate change, even for those currently experiencing its adverse effects. Therefore, the events and consequences described in the distal scenario are more far-reaching and may affect more individuals, thus contributing to the increase in the Townsville sample's threat perceptions shown here.

The non-significant difference between pre-exposure and after exposure to the proximal scenario may have occurred due to Townsville having recently experienced an extreme threat to water security (i.e., drought) before the data collection. Despite a mass flood occurring and the Ross River Dam being over-capacity, water restrictions were still in place. As a result of the recent drought in the region, the perceived threat of a drought within the sample may have already been high at baseline. The reality (pre-exposure) for participants of this study was similar to some of the information presented in the proximal scenario vignette. For example, the proximal scenario made reference to water restrictions being in place and a significant water security issue occurring. When presented with a proximal scenario about drought, similar to the event individuals just experienced, threat perceptions did not change from baseline to post-proximal scenario exposure. Perhaps as suggested in the health research by Roberto et al. (2019), repeated exposure is argued to desensitise viewers to the threat. Therefore, it is possibly not surprising that reading the proximal scenario produced little change in threat susceptibility and severity for the sample from their baseline perceptions, given there was no new or different threat to the one the sample may have recently experienced. Additionally, in support of these findings, for the proximal scenario, spatial and temporal factors were rated as the most important/influential for decision-making for the sample. These statements pertained to Townsville experiencing a major water security issue and that the region had not experienced substantial rain in over four years. These statements may have been ranked highly because the information within them was very much a reality for the sample.

Regarding self-and response-efficacy perceptions, there was a significant difference between baseline (pre-exposure) efficacy perceptions and post-exposure perceptions for both the proximal and distal scenarios. It appears that the presentation of any water security scenario, regardless of perceived distance, increased efficacy perceptions. However, no statistically significant difference in efficacy perceptions was reported between each scenario (proximal and distal). Exposure to either scenario resulted in significantly higher efficacy perceptions. This finding is argued to be attributed to the measurement of efficacy variables. By providing respondents with the behaviours they chose in the decision-making questions (the *how* and *why* behaviours choices), participants may feel confident in performing them and that such behaviours could reduce the threat of water security. Additionally, as explained in the methodology, the chosen behaviours were presented back to participants when considering their ratings of efficacy post-scenario exposure. Regardless of the scenario presented, participants were more like to choose the *how* behaviour. It is likely that participants saw the same behaviours when rating their efficacy perceptions after the proximal scenario exposure and after the distal scenario exposure. Therefore, participants would likely have rated the same behaviours twice after exposure to the scenarios concerning self- and response efficacy. As a result, it is perhaps not surprising that efficacy perceptions were similar across the distal and proximal scenarios. Whilst the method of presenting the behaviours to participants based on their own choices within the survey was chosen to counteract presentation effects, this had an unexpected implication for efficacy measures post scenario exposure.

To summarise, although perceptions were shown to change due to different scenario exposure, the results do not seem to align with the predictions of CLT. Although a large amount of research has suggested individuals discount the risk, do not act, or are not concerned about climate change when it is psychologically distant (Kortenkamp & Moore, 2006; Spence, Poortinga, & Pidgeon, 2011; van der Linden et al., 2015) the current research suggests this may not be the case for water security events, particularly those that occur locally and seasonally, especially in the Townsville context. Whilst it is clear that threat perceptions within the current sample are raised after exposure to a distal message, efficacy appears to be influenced by either proximal or distal messages. With this said, methodological limitations may have largely influenced this finding and should be considered in this interpretation.

Hypothesis two predicted that individuals who did perceive they had experienced a recent threat to their water security would have greater threat perceptions (susceptibility and severity) than those who did not. This hypothesis was an extension of hypothesis one, as the effect of previous experience on behaviour was a point raised in previous literature on environmental events (Haney, 2021; Milfont et al., 2014; Spence, Poortinga, Butler, et al., 2011) and was also of interest given the location of the study itself and the recent water-related events. In these studies, it was found that those who did perceive they had experienced a threat to their water security had significantly higher threat severity and susceptibility perceptions than those who did not feel they had experienced a water security threat.

In the current study, baseline measurements were argued to be the most accurate perceptions, given they were not manipulated by the experimental vignettes. These measurements indicated that those who had experienced a threat to their water security had higher threat-severity and susceptibility perceptions than those who had no experience. When taking into consideration scenario exposure, whether an individual perceived they had experienced a water security event or not had no significant influence on threat severity perceptions, as shown in Table 22.

Having experienced a threat previously would make an individual perceive they are more susceptible to future events, as it has happened before and is almost certain to occur again within the region (Spence, Poortinga, & Pidgeon, 2011; Zaalberg et al., 2009). Residents arguably would understand that water security would become an issue again, given the location, dry tropical climate, and timing of the study, regardless of the influx of rain before the data collection period. Thus, from a communication perspective, those who may not have experienced such events may need convincing about the personal relevance of the event in order to encourage behaviour change, specifically using information targeting threat susceptibility. This argument is based on previous research which has stated that proximity to the coastline and more frequent exposure to climate-related events (specifically flooding experiences) led to increased climate change beliefs, had greater concern for climate change and were more likely to engage in pro-environmental behaviour (Milfont et al., 2014; Spence, Poortinga, Butler, et al., 2011). This is also comparable to the research by Zaalberg et al. (2009), who found that residents living in flood-prone areas in the Netherlands were more worried about future flooding and perceived the consequences of future flooding as more severe, perceived themselves as more vulnerable to future flooding, and had stronger intentions to take adaptive actions, than those who had not been exposed to flooding. The current study, therefore, provides evidence to show that the effect of previous experience on threat perceptions may be applicable to other areas where water-related issues, like drought commonly occur. Therefore, for the current sample, given their exposure to such events both in terms of recency and frequency, it would be expected that previous experience would be an indicator of water conservation behaviour.

In the current study, 22% of the sample did not perceive they had experienced a threat to their water security, despite likely having previously experienced a major drought and flood, given the timing of the data collection. Although perhaps a true reflection of inexperience, it is also worth considering that this result may highlight the lack of understanding about what is viewed as a threat to water security. Furthermore, this may also suggest individuals recognised that such events were no longer a concern for the community, given their ability to cope with such events in the past. Given individuals living in the region are familiar with these events, this sample may not perceive these issues as long-term water security threats but rather as ‘natural disasters’ as they are commonly presented or described in the media (Hart & Feldman, 2014), which are likely to be accompanied by scare tactics to encourage behaviour. Furthermore, this group experienced a significant drought and was limited to specific water-related behaviour; however, they could still access and use the resource. This may have lessened threat perceptions of the drought and similar events threatening water security over time.

There is some consideration for the relationship between past environmental threat experiences negatively influencing future responses. For example, the research by Demuth et al. (2016) found that past hurricane experience, in terms of previous evacuation or financial loss, increased evacuation intentions. This has also been found in previous literature where experience led to increased behaviour (Haney, 2021; Spence, Poortinga, Butler, et al., 2011;

Zaalberg et al., 2009). However, the opposite has also been found, with those who experienced past hurricane-related emotional impacts (e.g., emotional distress) exhibiting lower self-efficacy, which decreased evacuation intentions (Demuth et al., 2016). Additionally, and more pertinent to the water-security context, Deng et al. (2017) found that previous drought experiences had no relationship with water-saving behaviour. This research may suggest that the concept of perceived experience requires a more in-depth examination to understand whether event context, event type, water security knowledge or coping strategies, among other factors, may have influenced participant responses in the current study, and more specifically in a region that frequently experiences water-related hazards. Regardless of these mixed findings, this raises concerns for future communication that may attempt to raise threat perceptions about water security to encourage mitigation behaviour in samples such as those from Townsville, where water-related hazards have frequently occurred.

As proposed by CLT (Trope & Liberman, 2010), hypothesis three predicted that individuals would choose the behaviour aligned with the *why* line of thinking when exposed to the distal scenario (exhibiting abstract thinking) and the *how* line of thinking when exposed to the proximal scenario (exhibiting concrete thinking). In this study, over half of all respondents selected behaviour related to the *how* line of thinking for every statement presented, regardless of the scenario. As suggested above, the current study's result may have occurred given the events presented in the scenarios may not be perceived as socially, temporally, spatially, or hypothetically distant to the respondents in this context. That is, the *how* response was commonly chosen by participants because both scenarios presented information that could be perceived as proximal. The issues presented in the scenarios are not 'abstract' but rather part of recent lived experience. Over 77% of the sample in the current study indicated they had recently experienced a threat to their water security. Furthermore, as suggested by Liberman and Trope (1998), in goal-directed activities, for example, conserving water, incidental, concrete and peripheral features are more likely to come to mind when presented with proximal events. Given water security threats are usual and commonly experienced by this population, these features of water conservation behaviour may come to mind for these respondents regardless of the psychological distance.

The results from this study also suggest that individuals in Townsville, regardless of how far away the water security threat is, do not consider why actions need to be performed to mitigate such threats but instead focus on those that are feasible. Individuals living in the region were given very clear directions from the local government about their water conservation behaviour and consequences for not following these directives. Therefore, the *why* for performing water-saving behaviours in this context is simply because it was a directive from the local government and thus may not be as important for decision-making in the context outside of this study. Those in the sample may know why these behaviours are important, given their experience with water security issues, thus are only concerned with the *how* they should be performed. This result again highlights the research conducted by Spence et al. (2011) and Haney (2021), where it was found that those who had direct flooding experiences felt confident that their actions would be effective in mitigating climate change. In both the current study and the research by Spence et al. (2011) and Haney (2021), the experience of water security threats may engage high-level construals and concrete thinking regarding mitigation behaviour. Therefore, experience may be just as effective as events being perceived as proximal in terms of behaviour mitigation.

Another finding of interest in the exploratory analyses, is that most respondents ranked the social distance statement as one of the least important after exposure to both scenarios. This is presumably due to the naturally ‘social’, ‘collective’ and ‘inclusive’ essence of environmental behaviour (Gifford, 2011) and that it takes *many* to see a change and that environmental events or the effects of such events impact many. This is arguably an important consideration as individuals may feel ‘hopeless’ about engagement with behaviour on this basis. This factor is potentially a barrier to environmental behaviour engagement in this region and, therefore, may be why it is ranked so low by respondents. Since environmental events always entail this collective element, it is difficult to manipulate this construct meaningfully and effectively in this context. Although differences were seen between scenario exposure and statement ranking, in that the social element was rated more critical after exposure to the proximal scenario, it appears being part of the Townsville region group or collective is not considered more important than spatial, temporal or hypothetical factors in the water security context. Additionally, looking at the wording of the distal social statement, which states that Australia is not the only country experiencing water insecurity, participants may have simply thought drought was not a major problem given other countries were experiencing it also.

Furthermore, with regard to CLT psychological distances, it is proposed that psychological distance dimensions are similar in how they are perceived. The manipulation of one aspect of distance may affect all other elements of distance as they are interrelated (Trope & Liberman, 2010). In the current research, it was evident that this does not appear to be the case, with different rankings of importance evident after each scenario exposure. It may be that with a specific and defined environmental hazard, such as water security threats like drought, three CLT factors (temporal, spatial and hypothetical) are useful in further understanding psychological distance in this context. This research not only demonstrates the potential utility of CLT in the water security context overall but specifically indicates which dimensions should be of focus in the Townsville region.

8.5.1 Implications

Taken together, there are theoretical and practical implications that have resulted from the current study. First, the application of CLT in the water security context appears mixed, with the results only aligning with CLT predictions for proximal scenario presentations for decision-making, given individuals chose the predicted line of thinking (as per CLT predictions) after exposure to the proximal scenario. Regardless of the mixed CLT findings, the manipulation of psychological distance more generally was able to influence threat perceptions in the sample, thus it may be a concept worth further exploration in the water security context. Additionally, the perceived experience of an event also appeared to affect threat perceptions, specifically that of threat susceptibility, when also taking into account psychological distance. These points may be pertinent to consider when exploring future perceptions of water-related events and are explored in greater depth in the general discussion. Wider implications for the use of CLT within the water security context will also be explored in the general discussion.

In terms of specific practical implications, for the Townsville region, presenting a distal message focused on temporal, spatial and hypothetical factors appeared to be most effective in terms of increasing threat perceptions. A communication of this nature could consider information regarding event likelihood (hypothetical), location (spatial) and estimated time of effect (temporal). For example:

Given previous instances of drought in the region, and the dry-tropical climate Townsville is subjected to, it is likely that Townsville will experience another drought period in the future (hypothetical). It is predicted this event will occur in the winter season (temporal), when our Dam capacity is of most concern. This dry spell will have long-lasting effects, such as extended periods of water restrictions for the entire Townsville community and the surrounding agricultural regions (spatial).

Given what is known about threat perceptions and their positive influence on behaviour, both in previous literature and from the findings of Study 1, such messages may have positive effects on behavioural uptake. Furthermore, given the mixed results regarding these findings, further research is recommended in terms of the *how* and *why* lines of decision-making. When considering the study findings, it seems that *how* behaviours, or otherwise known as *feasible* behaviours (Liberman & Trope, 1998; Trope & Liberman, 2010), are preferred and thus simply overcomplicating messages with *why* behaviours should be done may not serve the intended purpose of increasing actual behaviour in the water-security context, particularly for those in the Townsville region. This finding may also be extended to other regions that frequently experience water-related events.

8.5.2 Limitations

Although this study produced promising results, it is not without limitations. First, the results and conclusions of the study may be limited in their generalisability. Given that data collection occurred around the time of unprecedented weather events within Townsville, perceptions of water as reported by individuals in this study may have differed if this study was conducted at a time without such extreme weather events occurring. Additionally, these perceptions may also differ greatly from those in other locations throughout Australia, where water security may not be such an issue, or other groups where water is necessary for their livelihood and agricultural practices (e.g., farmers). It also seemed that there was an effect on the impact of recent events in Townsville (flood) on the results of the study, which was centred around perceptions of water insecurity. Furthermore, the sample also appeared to be largely student based, given the low average age, particularly compared to the sample recruited in Study 1. Whilst the results do provide more clarity on the use of CLT in this context, and furthermore, an in-depth understanding of perceptions of water security threats, this consideration should be taken into account when generalising these results to other regions within Australia. Future research should be conducted on these different populations in Australia to further examine perceptions of water.

Another arguable limitation of this study is practice effects. Whilst counterbalancing was conducted for the scenario presentations to limit this effect, the same questions regarding decision-making were asked after the presentation of each scenario, therefore arguably still presenting the issue of respondents selecting the same responses for both sets of questions. Attempting to control for practice effects by presenting different questions in the pre-and post-scenario exposure questions also had an unanticipated impact on reported efficacy perceptions after exposure to both scenarios. Whilst unavoidable due to the nature of the study, different methodological approaches could be taken in future research to control for practice effects. For example, future research could provide distal and proximal scenarios to different samples (as opposed to each participant seeing both scenarios) and compare results between groups to further identify differences between groups.

8.6 Concluding Remarks

Discussions about environmental events and encouraging mitigation behaviour often focus on the distant nature of such events and how that hinders mitigation behaviour to prevent them. There has been little critical analysis of psychological distance and its effects in the broad environmental context. The current study addressed the literature gap regarding the use of CLT, particularly in the water security context. The study demonstrated that when information was presented about a local and recurring water-related event in the future, CLT predictions do not hold regarding decision-making. Whilst the relationship between threat and behaviour is still not straightforward, it could be said that communicating distant, widespread water security threats, focused on spatial, temporal, and hypothetical message elements, is argued to result in a greater impact on cognitive process, in terms of attending, perceiving and responding to environmental events.

Chapter 9: General Discussion

9.1 General Overview

This project was developed in response to the increasing threat to water security in Australia, coupled with the lack of literature examining effective communication strategies to promote water conservation behaviour. Additionally, this project was also developed due to the minimal research using a theoretical approach to measure and evaluate engagement in water conservation behaviour in the water security context. Given that water management is often considered a technical challenge met by engineers, among others (Pearce et al., 2013), managing water through changing and addressing individual perception and behaviour is often less considered (Dolnicar & Hurlimann, 2010; Kneebone et al., 2020; Landon et al., 2016; Murti et al., 2016). Over two studies, the current research investigated how individuals used water, perceived a water-related threat and how their perception may have influenced decision-making to inform, address, and build upon the literature in the relevant contexts.

It is important to note that the interpretation and explanation of the findings for each study and reference to the literature have been covered in previous discussion sections. As such, the following discussion focuses on providing a broader integrative description of the project's findings as a whole. The discussion will attempt to extend and integrate the study findings with the relevant theories, threat perception in the water security context and social marketing literature identified in previous chapters.

9.1.1 The EPPM in the Environmental Context

Of interest to Study 1a of this thesis was the EPPM's ability to predict water conservation behaviour when individuals were subjected to a 'real' and naturally occurring environmental threat - water insecurity (specifically drought), in the Townsville region. The findings of Study 1a demonstrated the application of the EPPM in the environmental context, specifically in predicting water conservation behaviour in response to drought in the North Queensland region of Townsville. The results of Study 1a indicated that the EPPM variables of threat, self-efficacy, and response-efficacy could explain significant variability in water conservation behaviour over and above demographic variables. Although insightful, there was a large portion of unexplained variance in predicting water conservation behaviour for the sample. Previous research indicated that factors such as individual differences (Gore & Bracken, 2005; Peters et al., 2013; Xue et al., 2016) might make predicting environmental behaviour challenging. For this reason, it was suggested that individual cognitive differences might assist in explaining the large variability between threat and efficacy perceptions in the sample and thus the unexplained variance in the model.

9.1.2 Audience Segmentation

Study 1b further contributed to the literature regarding the use of the EPPM in the water security context by successfully demonstrating the clustering of a sample based on similar cognitive ratings of the EPPM variables while still holding true to the model’s original predictions. Following a social marketing approach, the sample was segmented into three clusters based on common standings on levels of the EPPM variables: threat, self-efficacy, and response-efficacy. Each group's reported water conservation behaviour differed significantly and was in line with the model’s behavioural predictions. For example, those in the proactive cluster, who had the highest threat and efficacy perceptions, also showed the greatest amount of behaviour. In contrast, those in the fearful externaliser cluster, who had heightened threat with minimal efficacy, showed the lowest amount of behaviours. These results provide more support for the model’s use in this novel context. More specifically, it was found that the cluster with moderate levels of perceived threat and the highest level of perceived efficacy also engaged in the most water-conservation behaviour.

The findings of Study 1b highlighted the variability in cognitions and perceptions of a water security threat in a large sample through the exploration of each cluster's differing perceptions and demographic characteristics. These characteristics were examined to determine which variables could be used to inform communications regarding water security issues. Clusters were given labels that referred to their overall, unique characteristics and EPPM variable levels. The groups were termed the “Unconcerned”, “Fearful externalisers”, and “Proactive” clusters. Recommendations for communications were then given based on each cluster’s high or low standings on EPPM variables and unique demographic characteristics.

Even though the diversity of the Townsville sample was further explored, there was still a large proportion of unexplained variance in water-conservation behaviour. Whilst the study provided many relevant recommendations for communicating a water-related threat to this sample to encourage behaviour, such communication of uncertain environmental events may be improved by further understanding how this uncertainty and on the contrary, previous experience, influences environmental-related decisions. This was further investigated in Study 2.

9.1.3 Psychological Distance and CLT

Unfortunately, the message recommendations suggested in Study 1 could not be implemented in the community due to the sudden (but welcomed) end of the drought period. Thus, Study 2 was based on the unique and under-researched nature of individual water security threat perceptions and the large variability in these perceptions, as evidenced in Study 1. Based on the first study's results, the argument was raised that individual perceptions of water security threats were not explained exclusively using the EPPM. With threat perceptions hypothesised to impact behaviour directly, having such a large variability within a sample makes it challenging to construct risk messages to encourage behaviour effectively. Therefore, Study 2 aimed to further explore the complicated nature of individual threat perceptions in the water security context.

After reviewing the literature examining the EPPM in the environmental context, there were noteworthy inconsistencies in the results of the studies using this model (e.g., Hart & Feldman, 2014; Perrault & Clark, 2018; Xue et al., 2016). The variation in results was hypothesised to be, at least partly, due to the context (environmental) in which the model was applied and how the model was examined (i.e., manipulated events or not). Study 2 was also based on the premise that individuals find it extremely difficult to comprehend and understand threats that are, at times, perceived as invisible, gradual, long-term and in the future (Gifford, 2011). Hence, Study 2 applied an experimental design to manipulate the perceived distance of water-related events (close in proximity (proximal) and far in proximity (distal)) to mimic communications of real-life environmental threat scenarios. Study 2 was based on the idea that understanding individual perceptions of environmental events in all contexts (i.e., current or not) will provide further information for effective communication strategies.

Study 2 manipulated the perceived psychological distance of water-related events using the CLT factors of psychological distance (Trope & Liberman, 2010). Previous research suggested that threat perceptions would be influenced by psychological distance, particularly that a close/proximal event would result in higher individual concerns and, therefore, the individual would be more receptive to it compared to a far/distal event (Scannell & Gifford, 2013; Spence, Poortinga, & Pidgeon, 2011). In contrast, the results of Study 2 indicated that individual threat perceptions were higher after exposure to the distal scenario. The results of Study 2 also indicated that previous perceived experience of a water security threat appears to increase threat perceptions of the sample. Having experienced a threat would make one perceive to be more susceptible, as it has happened before and is almost certain to occur again within the region (Spence, Poortinga, & Pidgeon, 2011; Zaalberg et al., 2009).

The effect of psychological distance on decision-making was also examined in this Study. As proposed by CLT (Trope & Liberman, 2010) and outlined in chapter 8, individuals were predicted to choose the behaviour aligned with the *why* line of thinking when exposed to the distal scenario (exhibiting abstract thinking) and the *how* line of thinking when exposed to the proximal scenario (exhibiting concrete thinking). However, it was evident in Study 2's results that the *how* line of thinking was engaged when considering water-related decisions, regardless of scenario distance. In Study 2, it was also found that each of the CLT statements had different levels of importance for decision-making for the sample after each scenario exposure. Whilst it is established that psychological distance plays a role in decision making, the mechanisms of psychological distance (i.e., social, hypothetical, temporal and spatial distances) may impact decision-making in different ways, particularly in the water security context where perceptions are variable.

Overall, Study 2 addressed the literature gap regarding the minimal use of CLT in the environmental context. The research also demonstrated that CLT predictions may not hold true when environmental events are distant. However, this result may be unique to the water security context, given its complex nature and the sample's location. These findings provide further information for constructing communications in the water security context and more information in the study of threat perceptions in this area, which are further discussed below.

9.2 Practical Implications of Results

There is an increasing challenge to manage water security during both drought and flooding events in light of the growing concern of climate change in Australia, expanding populations, and increasing agricultural and industrial activities (Gleick, 2012). Thus, developing strategic communication methods to encourage further water conservation, sustainability practices and to assist with the preparation for flooding events (and not only to increase attention) in the current circumstances is crucial. Water-saving campaigns are usually temporarily established in response to the onset of water security threats, such as drought, in desperation to avert or delay water restrictions, prevent monetary increases on water usage, or curb water usage in the short term (Syme et al., 2000). Additionally, campaigns are unlikely to educate communities about flooding and the impact this event might have on a region's water security. However, it appears that sustained water-saving campaigns need to be implemented long-term to maintain the conservative philosophy surrounding water, particularly in at-risk communities like Townsville, and also during heavy rainfall periods. In addition, messages about flooding are also suggested to be introduced in at-risk areas.

Given the economic pressure of significant systematic/technical changes to manage water (e.g., dam projects or desalination plants), changing human behaviour or perception may be a more cost-effective strategy for managing water security in Australia. Based on the combination of behaviour change models, such as the EPPM (Witte, 1992) and social marketing strategies (Hine et al., 2014) examined and applied in the current thesis, the current research has several recommendations for the EPPM's continued use and application in the novel context of water security.

First, messages should perhaps be created with a targeted focus on the EPPM variables of threat, self-efficacy, and response-efficacy. In Study 1a, it was found threat and efficacy were predictive of water conservation behaviour. Therefore, increasing these perceptions in populations to encourage behaviour would be recommended. Keeping the inverted-U theory of fear in mind, this approach would need to be applied with caution, so as not to fall into the outdated assumption that more fear leads to behaviour, like traditional fear appeal applications such as those developed for the health context, and created largely to induce fear in their intended audiences (Lewis, Watson, & Tay, 2007; Rigby et al., 1989; Shanahan et al., 2000; Tay & Watson, 2002). In addition, response-efficacy appeared to be the highest unique predictor for behaviour in this context. Thus, a substantial focus on communicating behavioural strategies directly affecting the event in question is highly encouraged to produce potential behaviour change.

Next, using the variables within the EPPM to explain the variability in water conservation behaviour by clustering like-minded individuals is recommended. Put simply, using tailored messages to target specific people (e.g., those most at risk of flooding events or those non-compliant with water restrictions). There was no known use in previous literature of the EPPM as a framework for segmenting populations into meaningful groups in the water security context, with only one known and explicit application in the health literature (Campo et al., 2012). The clusters described in Study 1b demonstrate that individuals' perceptions and cognitions toward an environmental threat impact environmental behaviour, specifically water conservation behaviour. Based on previous research (e.g., Cho and Salmon (2006)) and also current findings, it was shown that populations are not homogenous in terms of their opinion, beliefs, or behaviour about an issue, therefore showing the diversity amongst populations at risk. Creating smaller, more homogenous groups in at-risk communities based on their common threat and efficacy perceptions may be useful in predicting behaviour based on the hypothesis generated by EPPM.

Whilst the 'creation' of such groups, practically, is challenging, perhaps the simpler recommendation in this instance is to consider the sub-groups within a population to step away from the traditional 'one size fits all' method of communication. It is reasonable to assume that individuals' views, beliefs, perceptions, attitudes, and behaviour change over time, particularly in the environmental context. Whilst no group of individuals will ever have the same opinion or perceptions of an issue, communication needs to reflect that truth and thus be tailored to the differing cognitions present in a population. Thus a 'one size fits all' approach to communication in the water security context, whereby one message is created and is thought to be equally effective to an entire population, may be ineffective in encouraging water conservation behaviour or preparing people for a flood event. This same recommendation was made by Manning et al. (2013), who evaluated a prior water-saving initiative in the Townsville region years preceding Study 1. This thesis supports using a social marketing approach in this context by evidencing that individuals exhibiting different perceptions are likely to engage in differing levels of behaviour. The approach of creating multiple messages targeted at different sub-groups of a population addresses the demographic (e.g., age and location) and the psychological challenges (e.g., beliefs and attitudes) unique to the environmental context and the population experiencing an environmental threat. A detailed example of this is below.

To extend the point of segmenting populations, implementing messages to such populations is also of focus. Offering a theoretical and empirical understanding of behaviour in this context allows interventions to be constructed to encourage such behaviours. The measurement of differences between similar groups of individuals and the characteristics of groups themselves not only on the EPPM variables but also on demographic variables, optimises intervention design by determining which interventions may positively impact certain people. Constructing risk messages based on these principles or measuring such concepts in times of water security threats (both droughts and floods) could help predict behaviour and change it, such as explicitly recommended in the research by Dean et al. (2016). In this research, the authors suggested targeting specific social groups or settings to increase engagement in water-saving strategies (Dean et al., 2016). Furthermore, this same recommendation was also explicitly made in the Townsville context in the research on water-saving initiatives conducted by Manning et al. (2013). Broadly, targeting community members who have low efficacy perceptions with suggestions on how to save water in their homes further or those with low threat perceptions with communication around why not conserving water could have lasting adverse effects are some suggestions for implementing such an approach. Specifically, for the Townsville community, a focus could also be on the demographic factors that make up the clusters. For example, cluster 2 was older and comprised mostly of longer-term residents who were likely to own a home. Thus, communication tailored to these characteristics would be recommended to target this group of individuals specifically. This cluster may be more receptive to letterbox drops that suggest engagement in behaviours that are focused on the lawn or garden.

Furthermore and specifically considering CLT, the psychological distance of environmental events may encourage individuals to think such events are less likely to happen in the future and thus inhibit concern and importance, discount risks and reduce performance mitigation behaviour (Scannell & Gifford, 2013; Spence, Poortinga, & Pidgeon, 2011). Uncertainty is an inherent dimension of environmental communication, given the psychological distance of such events. Therefore, using and understanding CLT factors in risk messages (predominately the theory’s temporal, spatial and hypothetical factors) could also help to construct more effective risk communications. More specifically, temporal and spatial statements are recommended for use in proximal environmental threat messages, with the inclusion of hypothetical statements in distal environmental threat messages.

For the Townsville community specifically, where distal messages were found to be more influential on threat perceptions than proximal messages, communications focusing on the timing of annual rainfall (temporal), the uniqueness of the community in terms of its weather patterns or extent of the event (spatial) and indicating the likelihood of further dry periods (hypothetical) may be most effective. Framing messages around the components or factors that individuals find important and influential in their decision-making may increase threat perceptions and, therefore, behaviour. Practically, knowing this information could also best prepare individuals for water events, like floods and droughts. Understanding ways to encourage behaviour by constructing more effective risk communications is essential for society and the environment. For instance, state and local governments could employ such methods to curb water usage or increase awareness of the impact of flooding on freshwater resources in at-risk towns or communities by appealing to multiple or differing cognitive perceptions. This approach would be cost-effective in that its greater, targeted appeal would result in more mitigation behaviour and, potentially save the community's water supply in the long-term. Although framing messages around core values is not a new concept, acknowledging that these core values may influence threat perceptions directly is predicted to influence behaviour in this context.

Combining the findings of Study 1 and 2 would be most effective overall. This could mean tailoring targeted messages to at-risk or non-compliant groups using components of the EPPM and the relevant CLT factors. For example, for the Townsville community, specifically for cluster 1, who are comprised of younger individuals that are short-term residents of Townsville who were unlikely to own a home, this may be altering temporal, social and hypothetical characteristics in a distal communication that focuses on younger, shorter-term residents, via social media with a focus on indoor everyday water-saving initiatives easily adopted by renters. This message may include information such as:

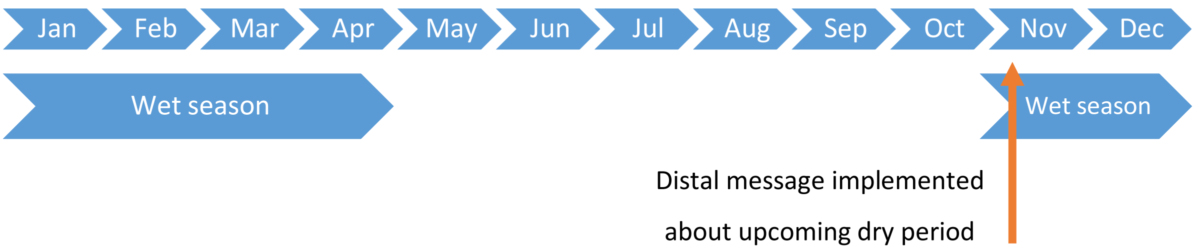
Given previous instances of drought in the region, and the dry-tropical climate Townsville is subjected to, it is likely that Townsville will experience another drought period in the future *(hypothetical CLT element to increase threat).* It is predicted this event will occur in the winter season *(temporal CLT element to increase threat)* when our Dam capacity is of most concern. This dry spell will have long-lasting effects, such as extended periods of water restrictions for the entire Townsville community and the surrounding agricultural regions *(spatial CLT element and presents a threat to broader environment to increase threat).* To avoid a drought in the future, here are some simple, everyday behaviours you can do around the home that can have a real-impact on that amount of water we use in our community:

- Shower for no longer than four minutes.
- Turn off the tap while brushing your teeth.
- Use a bucket to wash your vehicle *(everyday, renter friendly behaviour to increase efficacy).*

The research by Dolnicar and Hurlimann (2009) emphasised the diversity of individuals with regard to water supply context and previous experience. This research further highlights this premise, given previous exposure to such events also appears to play a role in increased threat perceptions. To address this, the timing of such strategies may also need to be considered. For example, immediately after exposure to a water security threat, individuals may have unusually high threat perceptions regarding large-scale traumatic events or have a small threat perception if they easily coped with the event. Regardless, in the Townsville context, distant events appear to produce higher threat perceptions, so it is recommended to provide timely information for residents conveying distant threat information, that will likely increase threat perceptions. For example, providing information as the annual rainfall begins about the upcoming dry phase of weather, or about the risk of floods when the annual rainfall event begins,would be best to prepare individuals for such events, as shown in Figure 13. Within Australia as a whole, the same approach could be taken, however, it may instead be based on weather seasons or during well-established weather periods (e.g., the Eastern coastline of Queensland has an annual cyclone or rainfall season running from November to April). This approach is hypothesised to result in more behavioural uptake within a community. Therefore, using the segmentation approach, coupled with the recommended CLT distance statements, considering previous experience or water supply context, as well as suggestions to release targeted communications at certain time periods, would likely encourage water conservation behaviour or assist people in preparing for a flood event.

Figure 13

Example of Timing of Communication for Townsville Community



9.3 Theoretical Implications of Results

The EPPM developed by Witte (1992), was initially established for use in the health context in response to health risk messages and to make specific predictions about an individual's response to a health message, depending on the interaction between an individual's threat and efficacy perceptions. The EPPM has assisted in predicting health behaviour in previous studies (e.g., Gore & Bracken, 2005; Hatchell et al., 2013; McKay et al., 2004); however, the model had not been investigated to any great extent in the environmental context for current threats that are not hypothetical, and on specific and localised environmental threats as opposed to broad issues such as climate change (Li, 2014; Perrault & Clark, 2018; Xue et al., 2016). While the model itself has not been used in this space, the major components of the theory, threat and efficacy, have been explicitly used in the water security context with demonstrated success in predicting behaviour and attitudes (e.g., Dolnicar & Hurlimann, 2009; Fielding et al., 2012; Mankad et al., 2013; Walton & Hume, 2011). Study 1 highlighted the success of the variables' ability to predict water conservation behaviour, adding to the literature using the model in an environmental context.

Furthermore, the current study demonstrates the use of the EPPM after exposure to a real-world environmental threat (i.e., drought), rather than a threat manipulated or fabricated in a message. The recommendation of using the model to predict behaviour in a naturalistic setting was made by Witte and Allen (2000) and thus attempted in Study 1 of this study. Compared to risk messages in the health context, this water security event examined in this study was happening in real-time for participants instead of being fabricated in a message. In Study 1, behaviour was also measured (as accurately as possible, given it was self-reported), and efficacy information was given to participants by the local government in the form of water restriction information provided to the community. This study not only raised questions regarding the model's use and transformation from theory to practice but shows evidence for its proposed theoretical relationships and robustness outside of the health context.

The original prediction of the model by its developers, also suggests an additive inter-relationship of variables, with threat perceptions being the first appraisal process, followed by efficacy (Witte, 1994). There is considerable debate in the literature regarding whether threat and efficacy have an additive or a multiplicative relationship (e.g., Popova, 2012; Witte & Allen, 2000). It seems that individual exposure to manipulated health threats (i.e., the model's original purpose, for example, the research conducted by Hatchell et al. (2013) and McKay et al. (2004)) and groups exposed to real environmental threats (e.g., the sample from Study 1), are likely to fit the model's original predictions. This was evidenced by no statistically significant relationship between threat and efficacy, but such variables still being predictive of behaviour. Additionally, after clustering and thus differing levels of threat and efficacy, it appears that these variables were still indicative of behaviour, as the EPPM predicts. The current research highlighted how individuals decide or behave in response to naturally occurring threats and appears to demonstrate that the hypotheses predicted by the EPPM hold true in both instances. As stated in the meta-analysis conducted by Witte and Allen (2000), whether the variable relationship is additive or multiplicative, the inclusion of both variables may still result in behaviour predictions, with this research further evidence for this statement. Thus, this research provides further support for the additive nature of the threat and efficacy relationship as originally proposed in the EPPM. This suggests that, in the water security context, feelings of efficacy are not reliant on threat perceptions to predict behaviour, but both factors contribute differently to behavioural prediction.

Additionally, in the water security context, and in response to real-world environmental events, the EPPM's appraisal process appears to work in the way the model suggests. This being that if a threat is perceived, the individual will be motivated to engage in the second appraisal process (self-efficacy). If there is no or minimal perceived self-efficacy, individuals will engage in a fear control response (e.g., message denial, avoidance). Alternatively, suppose efficacy is evoked and the behaviour suggested is considered effective in terms of mitigating the perceived threat, an individual is hypothesised to engage in a danger control response (e.g., engage in the appropriate type of action to avert the threatening event) (Witte, 1992). In the current research, specifically Study 1, this is evidenced by threat being perceived by all clusters and higher efficacy ratings indicating more reported water conservation behaviours (as shown by cluster 3).

Furthermore, it seems that the inverted-U theory of fear may also play a role in the water security context. For example, cluster 2 had the highest ratings of threat perceptions compared to other clusters but low efficacy ratings (the lowest reported self-efficacy compared to other clusters). Cluster 3 had lower threat perceptions than cluster 2 but higher efficacy perceptions. Additionally, cluster 3 reported more conservation behaviour, compared to cluster 2. It may be, as Janis and Feshbach suggested (1953, 1967), while fear arousal is necessary to motivate an individual to perform the required action, too much fear is predicted to lead to maladaptive outcomes. In this case, inadequate efficacy perceptions, coupled with a high-threat perception has appeared to result in less reported water conservation behaviour for cluster 2 in this sample, compared to cluster 3. This premise and the results of the research emphasise the importance of not presenting too much threat information, as suggested by the inverted-U theory of fear hypothesis (Janis, 1967; Janis & Feshbach, 1953) and including extensive efficacy information when considering the predictions of the EPPM (Witte, 1992). These considerations present further evidence for the use of the EPPM in conjunction with the inverted-U theory in the water-security and larger environmental context, given it can assist in explaining both response pathways, arguably necessary in communication and behaviour change research. Whilst the EPPM was developed based on the workings of Janis and Feshbach (1953) and maladaptive responses (i.e., fear responses), the current research brings the inclusion and examination of fear into primary focus in this context.

The last theoretical implication concerns CLT. CLT and its components (temporal, spatial, hypothetical, and social psychological distances) have had minimal application in the environmental context and even less so in the water security context. This theoretical basis has been commonly used to explore individual behaviour and decision-making in mundane, ordinary and unthreatening events (e.g., Fujita et al., 2006; Liviatan et al., 2008; Nussbaum et al., 2003; Wakslak et al., 2006). The results from Study 2 indicate there is still much left to be explored regarding the use of CLT in the environmental context and on real-world events.

Findings indicate that the psychological distance components (i.e., spatial, temporal, social and hypothetical distances) may provide a more concrete basis to form risk messages in the water security context. Specifically, when psychological distance is changed, certain CLT components are more influential or important in terms of decision-making. Thus, the current research demonstrates that one's construal level influences threat appraisals of environmental events.

Integrating CLT into threat assessment in the water-security context allows for a new approach to exploring how individual construals of a water-security event can potentially influence their behaviour. However, the model did not predict threat perceptions after exposure to the proximal events, as it hypothesises. Environmental events are inherently considered psychologically distant, on all accounts, given their unpredictability, uncontrollability, unknown effect and impact (Lorenzoni & Pidgeon, 2006). Previous research has also indicated that environmental events are perceived as psychologically distant by most (e.g., Milfont, 2010). For these reasons, individuals may perceive abstract information as more concerning compared to more concrete and detailed information. Additionally, the assumptions of CLT around decision-making were also not supported in this study, with participants more likely to select the *how* line of thinking regardless of the perceived distance of a threat. While this finding could be explained through the unique experiences of the sample and context in which the study was held, the underlying mechanisms of this model may not be appropriate to apply in the water security context. As this is one of the first studies to the author's knowledge to examine CLT within the water security space, further investigation of this model is recommended.

9.4 Limitations

At the conclusion of Study 1b, message recommendations were made with the intention of distributing these to the community to encourage further water conservation behaviour.

However, as suggested throughout this thesis, weather is often unpredictable. The monsoonal rainfall that occurred immediately after the end of Study 1 data collection inhibited the implementation of tailored messages to the community, limiting the ability of this thesis to directly test the effectiveness of such messages. Instead, this thesis resulted in a more in-depth analysis of threat perceptions to water-related events in general. Future research endeavours to explore the distribution and effect of these tailored messages, the original intention of the current research, and is discussed below.

The weather events in the Townsville region that occurred during the study period may also not reflect ‘normal’ weather events in Australia, or indeed Townsville at the time, given the unprecedented nature of these events in such a short time period. As such, generalising results to other communities or towns may be difficult because of the events themselves and the town's regional location. However, with the increasing occurrence of water-based natural disasters across Australia, it may be that other regions experience extreme weather events similar to those experienced by the current sample. Other larger cities or smaller towns that have a considerable reliance on water for agricultural purposes, that have different local and state government rules and laws, alternate community values and morals, or perhaps who use water mainly for business purposes, may not relate to the current study's findings. As such, considerations should be made when applying or replicating these methods described in the above studies elsewhere.

Next, the current research was interested in providing recommendations for developing more effective communication strategies for threat information. However, whilst media quality and quantity were measured in Study 1, media exposure (in terms of source) and trust in media source were not measured. These factors may positively or negatively contribute to one’s perceptions of efficacy and threat and, thus, behaviour and also provide more information about what sort of communications has been viewed by participants and whether communications may actually be effective in changing behaviour. Previous research has indicated the importance of establishing trust between media sources and the general public in crisis situations and the effect this may have on behavioural uptake (e.g., Du et al., 2017; Mehta et al., 2017). Additionally, media exposure could be variable and dependent on access, need, age, interest, and time and, therefore, may have provided further information in the cluster analysis in Study 1b. Given the premise was to inform communication in this context, future research could measure how much media and information exposure an individual has by type, whether social media, television, mail, or newspaper and the trust individuals hold in different media sources.

Last, with all behavioural research, another limitation is the nature of self-reporting behaviour and the timeframe in which an individual's behaviour is recorded (i.e., during a drought period with fines in place for non-compliance). The water issue within the Townsville region could be considered a sensitive topic, with local government enforced restrictions that resulted in monetary penalties for non-compliance. As a result, it would be reasonable to assume that participants in Study 1 may have had biased reporting for their behaviours. Although every effort was made to obtain more objective water conservation behaviour measures, a laboratory setting for this study would not have been appropriate. An observation-based investigation may have gathered more accurate data however, this would also be considered impractical. As the issue is politically sensitive, it could also be assumed that certain community groups or individuals may have responded to push an 'agenda'. A large and diverse community sample was recruited to counteract this effect in both studies.

9.5 Future Research

The current research suggests that the variables of threat and efficacy are useful in predicting water conservation behaviour. As the environmental threat of drought was happening in real-time, no manipulation of such variables needed to occur in Study 1. Therefore, future research could construct and then test the actual messages formulated as an outcome of Study 1. This could not be conducted as part of this study because the threat of drought or water insecurity diminished within days (due to a significant monsoon that affected the region). Additionally, given previous literature using the EPPM (and also other health models) rarely measure actual behaviour change (Peters et al., 2013), future research would endeavour to present tailored messages to a community experiencing a real threat to their water supply, and measure behaviour change using a pre-post experimental design to enable a more accurate application of the model in the water security context.

The rationale for this future research mentioned above is not only based in theory but also may be imperative to the water security issues Australia is experiencing (Beeson, 2020; Brears, 2017; Gregory & Hall, 2011). Research into facilitating factors or barriers to water conservation behaviour is essential for at-risk communities throughout Australia. For example, areas such as Townsville are in the dry tropics of Australia and are subject to highly variable yearly rainfall periods. If this annual rainfall does not occur for several years, this community is highly likely to be drought declared. As a result of this research, it is suggested that information could be used to construct and implement behaviour change strategies within the community before the risk of drought becomes disastrous. For example, targeted communications to encourage water conservation behaviour to groups resistant to engaging in conservation behaviour or who are wasteful with the resource would be recommended. If targeting a young population, the communication could be in the online medium and with older residents through a post drop or television advertising. These are just some relatively simple examples of many that could be employed in this context.

Additionally, future research could also examine the ability of the EPPM and/or CLT variables to predict other environmental behaviours as they naturally occur. Literature has used the EPPM to develop ‘staged’ environmental threats and has seen an effect in terms of the variables' abilities to predict behaviour (e.g., Perrault and Clark (2018)); however, understanding how individuals respond in real-time to real threats provides crucial information to manage such threats in the future. For example, implementing such research in communities that commonly experience cyclonic events, to develop communications to prepare residents for the following cyclone season, whether that be to engage in behaviour prior to the event, or behaviours after to effectively cope with damage and loss. In addition, having a control group who are not experiencing a threatening event to compare with those experiencing a real-life event would be helpful to test the true boundaries of the models and the suggested relationships between variables. Additionally, future research in terms of CLT's utility in the environmental context, in general, is also recommended and has been discussed above.

Future research is also recommended to further examine the influence of previous experience. There are mixed results in terms of the effect previous experience has on behaviour, intentions and perceptions (Demuth et al., 2016; Deng et al., 2017; Haney, 2021; Spence, Poortinga, Butler, et al., 2011; Zaalberg et al., 2009) with Study 2's results further adding to the mixed findings. In terms of previous experience of environmental events, a more in-depth examination may be required to truly understand whether event context, event type, or coping strategies may have influenced participant threat perceptions in the current study. Such research would generate a greater understanding of individual perceptions of, and responses to, water-related events in Australia.

The research has produced some interesting questions about measuring threat perceptions in the context of water security. In addition to being perceived as a necessity to survive, it has been argued throughout this thesis that water is perceived differently depending on individual location in terms of climate, societal norms/rules, and government regulations. This is evidenced in the findings of Study 1. Furthermore, environmental threat measurements do not consider the natural element of threat these events may carry due to their large-scale impact and unpredictability. In terms of research, a general threat perception scale may be argued to not effectively capture an individual's perception of water when threatened. Thus, there may be scope for a more refined threat measure to fit the environmental context. Therefore, these considerations (large-scale impact, and unpredictability) should be made when measuring such constructs in the future with current measures, and perhaps constructing a threat scale for specific use in this context is necessary.

In addition to threat measures in the environmental context, collective efficacy should also be considered. As stated throughout this thesis, environmental events cannot be solved on the virtue of a single action, a collective action is necessary to see meaningful change (Grunig, 1976). Therefore, in terms of research, a general efficacy perception scale may not effectively capture an individual's perception of water and mitigation actions given this consideration. Thus, there may be scope for a more refined efficacy measure to fit the environmental context, and collective efficacy should be considered when measuring such constructs in the future.

Last, further research into the concept of water security itself and whether an individual perceives local issues are part of a greater, broader water security issue within Australia would also be recommended. This consideration was explored by Deng et al. (2017), and it was found that abstract perceptions of climate change do not directly influence water-saving behaviours in response to more concrete events like drought. Additionally, the results in Study 1 also evidenced no relationship between general environmental attitudes and threat and efficacy perceptions of a localised threat. Furthermore, earlier in the thesis it was also shown that there is a clear discrepancy within the literature regarding what urban water security means and how it can be achieved (e.g., Brears (2017), Gerlak et al. (2018) and Allan et al. (2021)). In the context of the current thesis, the drought in the region may not have been *perceived* as a threat to individual water security by participants in Study 2, but perhaps as a minor or short-term inconvenience that would be over once the annual rainfall occurred. Therefore, further investigation into what individuals perceive as events that do affect their water security and what it means to be water-secure to the Australian population may provide a more thorough understanding of water-security and how to mitigate water-insecurity in Australia. Furthermore, conducting such research in areas that may commonly experience such events (and cope) or in areas that experience these events less frequently would provide further information regarding the influence of contextual factors on these perceptions and water-related behaviours.

9.6 Concluding Remarks

The goal of achieving water security in Australia is to secure a finite natural resource that could be recyclable and meet consumer demands in a highly regulated market where price, quality, and environmental considerations are arguably as important as each other (Pearce, Dessai, and Bar 2013). To manage water security threats and secure water for the country, the liability is passed from water companies and government bodies to the consumer or user to curb their water usage for the betterment of themselves and the community, country and environment as a whole. Unfortunately, this reality has resulted in viewing the consumer as uncontrollable or at fault when such behaviours are not adhered to (Pearce, Dessai, and Bar 2013). This bottom-up approach to water security management is a harsh reality for Australia and one which this thesis has attempted to understand. As the threat of climate change increases and events such as drought or water insecurity become increasingly prominent for our communities, communicating individual values and localised issues will become more critical. Experiencing a greater frequency of water-related threats brings larger issues, like the country's water scarcity, into local and temporal focus.

The current project offered recommendations for environmental campaign construction to encourage water conservation behaviour in the face of continued environmental stress. The variables of self-efficacy, response-efficacy and threat were found to be useful in predicting water conservation behaviour and clustering individuals. Clustering allowed the construction of more homogenous, manageable samples to enable tailored message production, with the inter-relationship between threat and efficacy variables similar to those seen in the health context. Additionally, altering the psychological distance of events holds promise regarding distant threats increasing threat perceptions, with hypothetical, spatial and temporal statements about such circumstances the most beneficial. Given the unprecedented nature of environmental events affecting the world, it is hoped this research can provide some valuable recommendations to assist in constructing threat messages and environmental campaigns to encourage behaviour. Additionally, it is hoped that this research can provide the basis for further environmental threat research and, more specifically, inform research regarding the complex nature of water security perceptions in the future.

References

Aaker, J. L., Brumbaugh, A. M., & Grier, S. A. (2000). Nontarget markets and viewer distinctiveness: The impact of target marketing on advertising attitudes. *Journal of Consumer Psychology, 9*(3), 127-140. https://doi.org/10.1207/S15327663JCP0903_1

Abu Bakar, M. F., Wu, W., Proverbs, D., & Mavritsaki, E. (2021). Effective communication for water resilient communities: A conceptual framework. *Water, 13*. https://doi.org/10.3390/w13202880

Ajzen, I. (1985). From intentions to actions: A theory of planned behaviour. In J. Kuhl & J. Beckman (Eds.), *Action-control: From cognition to behaviour*. Heidelberg: Springer Verlag.

Ajzen, I. (1991). The theory of planned behaviour. *Organizational behaviour and human decision processes, 50*, 199.

Algie, J., & Rossiter, J. R. (2010). Fear patterns: A new approach to designing road safety advertisments. *Journal of Prevention & Intervention in the Community, 38*(4). https://doi.org/10.1080/10852352.2010.509019

Allan, J. V., Fielding, K. S., Kenway, S. J., & Head, B. W. (2021). Community perspectives on sustainable urban water security. *Urban Water Journal*. https://doi.org/10.1080/1573062X.2021.2001545

Australian Bureau of Statistics. (2020a). *Region Summary: Townsville*. https://dbr.abs.gov.au/region.html?lyr=sa4&rgn=318

Australian Bureau of Statistics. (2020b, 10/07/2020). Water Account, Australia: 2017-18. https://www.abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/4610.0Main%20Features22017-18?opendocument&tabname=Summary&prodno=4610.0&issue=2017-18&num=&view=

Australian Government: Department of Home Affairs. (2018). *Profiling Australia's Vulnerability: The interconnected causes and cascading effects of systemic disaster risk.*

Australian Government: Productivity Commission. (2021). *Government investment in major water infrastructure. Nation Water Reform 2020. Inquiry Report no. 96.* https://www.pc.gov.au/inquiries/completed/water-reform-2020/report/water-reform-2020-supportingi.pdf

Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology, 27*(1), 14-25. https://doi.org/10.1016/j.jenvp.2006.12.002

Bandura, A. (1977). *Social learning theory*. Prentice-Hall.

Barr, S. (2006). Environmental action in the home: Investigating the 'Value-Action' gap. *Geography, 91*(1), 43-54. http://www.jstor.org.elibrary.jcu.edu.au/stable/40574132

Basil, M., Basil, D., Deshpande, S., & Lavack, A. M. (2013). Applying the extended parallel process model to workplace safety messages. *Health Communication, 28*(1), 29-39. https://doi.org/10.1080/10410236.2012.708632

Batchelder, A., & Matusitz, J. (2014). "Let's Move" campaign: Applying the extended parallel process model. *Social Work in Public Health, 29*(5), 432-472. https://doi.org/10.1080/19371918.2013.865110

Beck, K. H., & Frankel, A. (1981). A conceptualization of threat communications and protective health behavior. *Social Psychology Quarterly, 44*(3), 204-217. https://doi.org/10.2307/3033834.

Beeson, G. (2020). *A Water Story*. https://doi.org/10.1071/9781486311309

Boslaugh, S. E., Kreuter, M. W., Nicholson, R. A., & Naleid, K. (2005). Comparing demographic, health status and psychosocial strategies of audience segmentation to promote physical activity. *Health Education Research: Theory and Practice, 20*(4), 430-438. https://doi.org/10.1093/her/cyg138

Bouwer, L. M. (2019). Observed and projected impacts from extreme weather events: Implications for loss and damage. In R. Mechler, Bouwer, L., Schinko, T., Surminski, S., Linnerooth-Bayer, J. (Ed.), *Loss and damage from climate change. Climate risk management, policy and governance*. Springer, Cham. https://doi.org/10.1007/978-3-319-72026-5_3

Brears, R. C. (2017). *Urban Water Security*. Wiley. https://doi.org/https://doi.org/10.1002/9781119131755

Bureau of Meteorology: Australian Government. (2016). *What is La Niña and how does it impact Australia?* http://www.bom.gov.au/climate/updates/articles/a020.shtml

Bureau of Meteorology: Australian Government. (2018). *Australian climate variability and change - trend maps*. http://www.bom.gov.au/climate/change/#tabs=Tracker&tracker=trend-maps&tQ=map%3Drain%26area%3Daus%26season%3D0112%26period%3D1980

Bureau of Meteorology: Australian Government. (2019a). *Annual Climate Statement 2019*. http://www.bom.gov.au/climate/current/annual/aus/#tabs=Rainfall

Bureau of Meteorology: Australian Government. (2019b). *Rainfall deficiences and water availability*. http://www.bom.gov.au/climate/drought/#tabs=What-is-drought

Bureau of Meteorology: Australian Government. (2020). *Seasonal Climate Summary for Northern Territory*. Retrieved 15/07/2020 from http://www.bom.gov.au/climate/current/season/nt/summary.shtml

Campo, S., Askelson, N. M., Carter, K. D., & Losch, M. (2012). Segmenting audiences and tailoring messages: Using the extended parallel process model and cluster analysis to improve health campaigns. *Social Marketing Quarterly, 18*(2), 98-111. https://doi.org/10.1177/1524500412450490

Carey, R. N., & Sarma, K. M. (2016). Threat appeals in health communication: messages that elicit fear and enhance perceived efficacy positively impact on young male drivers. *BMC Public Health, 16*(1), 645. https://doi.org/10.1186/s12889-016-3227-2

Carmi, N., & Bartal, E. (2014). Perception of environmental threat in the shadow of war: The effect of future orientation. *Human and Ecological Risk Assessment: An International Journal*, *20*(3), 872-886. https://doi.org/10.1080/10807039.2013.798217

Cho, H., & Salmon, C. T. (2006). Fear appeals for individuals in different stages of change: Intended and unintended effects and implications on public health campaigns. *Health Communication*, *20*(1), 91-99. https://doi.org/10.1207/s15327027hc2001_9

Cismaru, M., Lavack, A. M., Hadjistavropoulos, H., & Dorsch, K. D. (2008). Understanding health behavior: An integrated model for social marketers. *Social Marketing Quarterly, 14*(2), 2-32. https://doi.org/10.1080/15245000802034663

Cockerill, K., Groothuis, P. A., McDaniel, T., & Cooper, C. (2016). Individualized water source as an indicator of attitudes about water management and conservation in humid regions. *Journal of Environmental Planning and Management, 59*(8), 1341-1359. https://doi.org/10.1080/09640568.2015.1075871

Covello, V. T., Peters, R. G., Wojtecki, J. G., & Hyde, R. C. (2001). Risk communication, the West Nile virus epidemic, and bioterrorism: Responding to the communication challenges posed by the intentional or unintentional release of a pathogen in an urban setting. *Journal of Urban Health, 78*(2), 382-391. https://doi.org/10.1093/jurban/78.2.382

CSIRO. (2011). *Water: Science and Solutions for Australia* (I. P. Prosser, Ed.). CSIRO Publishing.

CSIRO, & Bureau of Meteorology: Australian Government. (2015). *Climate Change in Australia Information for Australia's Natural Resource Management Regions: Technical Report* (Information for Australia's Natural Resource Management Regions: Technical Report, Issue. https://www.climatechangeinaustralia.gov.au/media/ccia/2.1.6/cms_page_media/168/CCIA_2015_NRM_TechnicalReport_WEB.pdf

Dean, A. J., Fielding, K. S., & Wilson, K. A. (2019). Building community support for coastal management - What types of messages are most effective? *Environmental Science & Policy*, *92*, 161-169. https://doi.org/10.1016/j.envsci.2018.11.026

Dean, A. J., Lindsay, J., Fielding, K. S., & Smith, L. D. G. (2016). Fostering water sensitive citizenship – Community profiles of engagement in water-related issues. *Environmental Science & Policy*, *55*, 238-247. https://doi.org/10.1016/j.envsci.2015.10.016

Demuth, J. L., Morss, R. E., Lazo, J. K., & Trumbo, C. (2016). The effects of past hurricane experiences on evacuation intentions through risk perception and efficacy beliefs: A mediation analysis. *Weather, Climate, and Society*, *8*(4), 327-344. https://doi.org/10.1175/WCAS-D-15-0074.1

Deng, Y., Wang, M., & Yousefpour, R. (2017). How do people's perceptions and climatic disaster experiences influence their daily behaviors regarding adaptation to climate change? - A case study among young generations. *Science of the Total Environment*, *581-582*, 840–847. https://doi.org/10.1016/j.scitotenv.2017.01.022

Dijkstra, A., & De Vries, H. (2000). Subtypes of precontemplating smokers defined by different long-term plans to change their smoking behavior. *Health Education Research: Theory and Practice, 15*(4), 423-434. https://doi.org/10.1093/her/15.4.423

Dolnicar, S., Grun, B., & Leisch, F. (2018). *Market Segmentation Analysis: Understanding It, Doing It, and Making It Useful*. Springer.

Dolnicar, S., & Hurlimann, A. (2009). Drinking water from alternative water sources: Differences in beliefs, social norms and factors of perceived behavioural control across eight Australian locations. *Water Science and Technology*, *60*(6), 1433-1444. https://doi.org/10.2166/wst.2009.325

Dolnicar, S., & Hurlimann, A. (2010). Australians' water conservation behaviours and attitudes. *Australasian Journal of Water Resources*, *14*(1), 43-53. https://doi.org/10.1080/13241583.2010.11465373

Du, E., Cai, X., Sun, Z., & Minsker, B. (2017). Exploring the role of social media and individual behaviors in flood evacuation processes: An agent based modeling approach. *Water Resources Research, 53*, 9164-9180. https://doi.org/10.1002/2017WR021192

Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). New trends in measuring environmental attitudes: Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues, 56*(3), 425-442. https://doi.org/10.1111/0022-4537.00176

Fielding, K. S., Russell, S., Spinks, A., & Mankad, A. (2012). Determinants of household water conservation: The role of demographic, infrastructure, behavior, and psychosocial values. *Water Resources Research, 48*(10), 1-12. https://doi.org/10.1029/2012WR012398

Finer, L. B., & Henshaw, S. K. (2006). Disparities in rates of unintended pregnancy in the United States, 1994 and 2001. *Perspectives on Sexual and Reproductive Health, 38*(2), 90-96. https://doi.org/10.1363/psrh.38.090.06

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Addison-Wesley.

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. Taylor and Francis.

Fujita, K., Henderson, M. D., Eng, J., Trope, Y., & Liberman, N. (2006). Spatial distance and mental construal of social events. *Psychological Science*, *17*(4), 278-282. https://doi.org/10.1111/j.1467-9280.2006.01698.x

Gerlak, A. K., House-Peters, L., Varady, R. G., Albrecht, T., Zuniga-Teran, A., Routson de Grenade, R., Cook, C., & Scott, C. A. (2018). Water security: A review of place-based research. *Environmental Science and Policy, 82*, 79-89. https://doi.org/10.1016/j.envsci.2018.01.009

Gharlipour, Z., Hazavehei, S. M. M., Moeini, B., Nazari, M., Beigi, A. M., Tavassoli, E., Heydarabadi, A. B., Reisi, M., & Barkati, H. (2015). The effect of preventive educational program in cigarette smoking: Extended parallel process model. *Journal of Education and Health Promotion, 4*, 4. https://doi.org/10.4103/2277-9531.151875

Gifford, R. (2011). The dragons of inaction: Psychological barriers that limit climate change mitigation and adaption. *American Psychologist, 66*(4), 290-302. https://doi.org/10.1037/a0023566

Gilg, A., & Barr, S. (2006). Behavioural attitudes towards water saving? Evidence from a study of environmental actions. *Ecological Economics, 57*(3), 400-414. https://doi.org/10.1016/j.ecolecon.2005.04.010

Gleick, P. H. (2012). *The World's Water: The Biennial Report on Freshwater Resources*. Island Press.

Gore, T. D., & Bracken, C. C. (2005). Testing the theoretical design of a health risk Message: Re-examining the major tenets of the extended parallel process model. *Health Education & Behavior*, *32*(1), 27-41. https://doi.org/10.1177/1090198104266901

Government of Canada. (n.d.). *Physical Activity Tips for Adults (18-64 years)*. https://www.canada.ca/en/public-health/services/publications/healthy-living/physical-activity-tips-adults-18-64-years.html

Gregory, A., & Hall, M. (2011). *Urban water sustainability*. CSIRO.

Grier, S. A., & Kumanyika, S. (2010). Targeted marketing and public health. *Annual Review of Public Health*, *31*, 349-369. https://doi.org/10.1146/annurev.publhealth.012809.103607

Grunig, J. E. (1976). Communication behaviors occurring in decision and non-decision situations. *Journalism & Mass Communication Quarterly*, *53*(1), 252-262. https://doi.org/10.1177/107769907605300209

Haney, T. J. (2021). Disrupting the complacency: Disaster experience and emergent environmentalism. *Socius*, *7*, 1-17. https://doi.org/10.1177/2378023121992934

Hart, P. S., & Feldman, L. (2014). Threat without efficacy? Climate change on U.S. network news. *Science Communication*, *36*(3), 325-351. https://doi.org/10.1177/1075547013520239

Hatchell, A. C., Bassett-Gunter, R. L., Clarke, M., Kimura, S., & Latimer-Cheung, A. E. (2013). Messages for men: The efficacy of EPPM-based messages targeting men's physical activity. *Health Psychology*, *32*(1), 24-32. https://doi.org/10.1037/a0030108

Head, B. W. (2007). Community engagement: Participation on whose terms? *Australian Journal of Political Science, 42*(3), 441-454. https://doi.org/10.1080/10361140701513570

Henderson, M. D., Fujita, K., Trope, Y., & Liberman, N. (2006). Transcending the "here": The effect of spatial distance on social judgement. *Journal of Personality and Social Psychology, 91*(5), 845-856. https://doi.org/10.1037/0022-3514.91.5.845

Hine, D. W., Reser, J. P., Morrison, M., Phillips, W. J., Nunn, P., & Cooksey, R. (2014). Audience segmentation and climate change communication: Conceptual and methodological considerations. *WIREs Climate Change*, *5*(4), 441-459. https://doi.org/10.1002/wcc.279

Howell, R. A. (2014). Investigating the long-term impacts of climate change communications on invidual's attitudes and behavior. *Environment and Behavior, 46*(1), 70-101. https://doi.org/10.1177/0013916512452428

IPCC. (2014). *Climate Change 2014: Impacts, Adaptation, and Vulnerability.* (Assessment Report 5). https://www.ipcc.ch/report/ar5/wg2/

IPCC. (2022). *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.*

Jain, A. K., & Dubes, R. C. (1988). *Algorithms for Clustering Data*. Prentice Hall Inc.

Janis, I. L. (1967). Effects of fear arousal on attitude change: Recent developments in theory and experimental research1. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology* (Vol. 3, pp. 166-224). Academic Press. https://doi.org/10.1016/S0065-2601(08)60344-5

Janis, I. L., & Feshbach, S. (1953). Effects of fear-arousing communications. *The Journal of Abnormal and Social Psychology*, *48*(1), 78-92. https://doi.org/10.1037/h0060732

Katz-Kimchi, M., & Atkinson, L. (2014). Popular climate science and painless consumer choices: Communicating climate change in the hot pink flamingos exhibit, monterey bay aquarium, California. *Science Communication, 36*(6), 754-777. https://doi.org/10.1177/1075547014555998

Kidd, L. R., Garrard, G. E., Bekessy, S. A., Mills, M., Camilleri, A. R., Fidler, F., Fielding, K. S., Gordon, A., Gregg, E. A., Kusmanoff, A. M., Louis, W. R., Moon, K., Robinson, J. A., Selinske, M. J., Shanahan, D., & Adams, V. M. (2019). Messaging matters: A systematic review of the conservation messaging literature. *Biological Conservation*, *236*(1), 92-99. https://doi.org/10.1016/j.biocon.2019.05.020

Kim, S., Jeong, S.-H., & Hwang, Y. (2013). Predictors of pro-environmental behaviors of American and Korean students: The application of the theory of reasoned action and protection motivation theory. *Science Communication*, *35*(2), 168-188. https://doi.org/10.1177/1075547012441692

Kneebone, S., Smith, L., & Fielding, K. (2020). Whose view do we use? Comparing expert water rofessional and lay householder perspectives on water-saving behaviours. *Urban Water Journal*, *17*(10), 884-895. https://doi.org/10.1080/1573062X.2020.1828496

Kodinariya, T. M., & Makwana, P. R. (2013). Review on determining number of Cluster in K-Means Clustering. *International Journal of Advance Research in Computer Science and Management Studies*, *1*(6), 90-95. https://www.academia.edu/5514429/Review_on_determining_number_of_Cluster_in_K_Means_Clustering

Koop, S. H. A., Van Dorssen, A. J., & Brouwer, S. (2019). Enhancing domestic water conservation behaviour: A review of empirical studies on influencing tactics. *Journal* *of Environmental Management*, *247*, 867-876. https://doi.org/10.1016/j.jenvman.2019.06.126

Kortenkamp, K. V., & Moore, C. F. (2006). Time, uncertainty, and individual differences in decisions to cooperate in resource dilemmas. *Personality and Social Psychology Bulletin*, *32*(5), 603-615. https://doi.org/10.1177/0146167205284006

Kotler, P., & Lee, N. R. (2008). *Social Marketing: Influencing behaviors for good* (3 ed.). Sage. https://books.google.com.au/books?hl=en&lr=&id=PoHa1HSukoMC&oi=fnd&pg=PR1&dq=Kotler,+P.,+%26+Lee,+N.+R.+(2008).+Social+marketing:+Influencing+behaviors+for+good.+(3rd+ed.).+Thousand+Oaks,+CA:+Sage.&ots=FevO2IF0kj&sig=d_4TwW5oOdCrlNlaPMgasOBpd4s#v=onepage&q=Kotler%2C%20P.%2C%20%26%20Lee%2C%20N.%20R.%20(2008).%20Social%20marketing%3A%20Influencing%20behaviors%20for%20good.%20(3rd%20ed.).%20Thousand%20Oaks%2C%20CA%3A%20Sage.&f=false

Landon, A. C., Kyle, G. T., & Kaiser, R. A. (2016). Predicting compliance with an information-based residential outdoor water conservation program. *Journal of Hydrology*, *536*, 26-36. https://doi.org/10.1016/j.jhydrol.2016.02.024

Lavack, A. M., Magnuson, S. L., Deshpande, S., & Basil, D. Z. (2008, 08/2008). Enhancing occupational health and safety in young workers: The role of social marketing. *International journal of nonprofit and voluntary sector marketing*, *13*(3), 193-204. https://doi.org/10.1002/nvsm.322

Lefebvre, C. R., & Flora, J. A. (1988). Social marketing and pubic health intervention. *Health Education & Behavior*, *15*(3), 299-315. https://doi.org/10.1177/109019818801500305

Leventhal, H. (1970). Findings and theory in the study of fear communications1. In B. Leonard (Ed.), *Advances in Experimental Social Psychology* (Vol. Volume 5, pp. 119-186). Academic Press. https://doi.org/10.1016/S0065-2601(08)60091-X

Lewis, I., Watson, B., & Tay, R. (2007). Examining the effectiveness of physical threats in road safety advertising: The role of the third-person effect, gender, and age. *Transportation Research Part F: Traffic Psychology and Behaviour, 10*(1), 48-60. https://doi.org/10.1016/j.trf.2006.05.001

Lewis, I., Watson, B., Tay, R., & White, K. M. (2007). The role of fear appeals in improving driver safety: A review of the effectiveness of fear-arousing (threat) appeals in road safety advertising. *Internation Journal of Behavioral Consultation and Therapy 3*(2), 203-222. https://doi.org/10.1037/h0100799

Li, S. S. (2014). Fear appeals and college students' attitudes and behavioral intentions toward global warming. *The Journal of Environmental Education, 45*(4), 243-257. https://doi.org/10.1080/00958964.2014.930399

Liberman, N., & Trope, Y. (1998). The role of feasibility and desirability considerations in near and distant future decisions: A test of temporal construal theory. *Journal of Personality and Social Psychology, 75*(1), 5-18. https://doi.org/10.1037/0022-3514.75.1.5

Liberman, N., & Trope, Y. (2008). The psychology of transcending the here and now. *Science, 322*(5905), 1201-1205. https://doi.org/10.1126/science.1161958

Liberman, N., & Trope, Y. (2014). Traversing psychological distance. *Trends in Cognitive Sciences, 18*(7), 364-369. https://doi.org/10.1016/j.tics.2014.03.001

Liberman, N., Trope, Y., & Stephan, E. (2007). Psychological distance. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social Psychology: Handbook of Basic Principles* (2nd ed., pp. 353-383). Guildford.

Liviatan, I., Trope, Y., & Liberman, N. (2008). Interpersonal similarity as a social distance dimension: Implications for perception of others' actions. *Journal of Experimental Social Psychology 44*(1), 1256-1269. https://doi.org/10.1016/j.jesp.2008.04.007

Lorenzoni, I., Jones, M., & Turnpenny, J. R. (2007). Climate change, human genetics, and post-normality in the UK. *Futures, 39*(1), 65-82. https://doi.org/10.1016/j.futures.2006.03.005

Lorenzoni, I., & Pidgeon, N. F. (2006). Public views on climate change: European and USA perspectives. *Climate Change; Dordrecht, 77*(1-2), 73-95. https://doi.org/10.1007/s10584-006-9072-z

Maddux, J. E. (1993). Social cognitive models of health and exercise behavior: An introduction and review of conceptual issues. *Journal of Applied Sport Psychology, 5*(2), 116-140. https://doi.org/10.1080/10413209308411310

Maibach, E. W., Leiserowitz, A., Roser-Renouf, C., & Mertz, C. K. (2011). Identifying like-minded audiences for global warming public engagment campaigns: An audience segmentation analysis and tool development. *PLoS ONE, 6*(3). https://doi.org/10.1371/journal.pone.0017571

Maloney, E. K., Lapinski, M. K., & Witte, K. (2011). Fear appeals and persuasion: A review and update of the extended parallel process model. *Social and Personality Psychology Compass, 5*(4), 206-219. https://doi.org/10.1111/j.1751-9004.2011.00341.x

Mankad, A., Greenhill, M., Tucker, D., & Tapsuwan, S. (2013). Motivational indicators of protective behaviour in response to urban water shortage threat. *Journal of Hydrology, 491*(1), 100-107. https://doi.org/10.1016/j.jhydrol.2013.04.002

Manning, C., Hargroves, K., Walker, M., Lange, J., Igloi, S., Bruce, G., & Desha, C. (2013). *Dry tropics water smart: A community based approach to residential outdoor water* *consumption.* Australian Water Association Conference (OzWater 2013), Perth Convention and Exhibition Centre, Perth, Western Australia, Australia.

Mathijssen, J., Janssen, M., van Bon-Martens, M., & van de Goor, L. (2012). Adolescents and alcohol: An exploratorive audience segmentation analysis. *BMC Public Health, 12*(742). https://doi.org/10.1186/1471-2458-12-742

McKay, D. L., Berkowitz, J. M., Blumberg, J. B., & Goldberg, J. P. (2004). Communicating cardiovascular disease risk due to elevated homocysteine levels: Using the EPPM to develop print materials. *Health Education & Behavior*, *31*(3), 355-371. https://doi.org/10.1177/1090198104263353

Mehta, A. M., Bruns, A., & Newton, J. (2017). Trust, but verify: Social media models for disaster management *Disasters*, *41*(3), 549-565. https://doi.org/http://10.1111/disa.12218

Milfont, T. L. (2010). Global warming, climate change and human psychology. In V. Corral-Verdugo, C. H. Garcia-Cadana, & M. FriasArment (Eds.), *Psychological Approaches to Sustainability: Current Trends in Theory, Research and Practice*. Nova Science.

Milfont, T. L., Evans, L., Sibley, C. G., Ries, J., & Cunningham, A. (2014). Proximity to coast is linked to climate change belief. *PLoS ONE*, *9*(7), 1-8. https://doi.org/10.1371/journal.pone.0103180

Moser, S. C., & Dilling, L. (2004). Making climate hot. *Environment 46*(10), 32-46. https://doi.org/10.1080/00139150409605820

Murti, M., Yard, E., Kramer, R., Haselow, D., Mettler, M., McElvany, R., & Martin, C. (2016). Impact of the 2012 extreme drought conditions on private well owners in the United States, a qualitative analysis. *BMC Public Health*, *16*(430), 1-10. https://doi.org/10.1186/s12889-016-3039-4

Muthusamy, N., Levine, T. R., & Weber, R. (2009). Scaring the already scared: Some problems with HIV/AIDS fear appeals in Namibia. *Journal of Communication, 59*(2), 317-344. https://doi.org/10.1111/j.1460-2466.2009.01418.x

Noble, G., & Noble, E. (1988). On the use and misuse of mass media by governments. *Australian Journal of Communication, 13*, 1-15.

Norgaard, K. M. (2011). Living in denial: Climate change, emotions, and everyday life In *Living in denial: climate change, emotions, and everyday life*. The MIT Press. https://doi.org/10.7551/mitpress/9780262015448.001.0001

Nussbaum, S., Liberman, N., & Trope, Y. (2003). Creeping dispositionism: The temporal dynamics of behavior prediction. *Journal of Personality and Social Psychology, 84*(3), 485-497. https://doi.org/10.1037/0022-3514.84.3.485

O'Neill, S., & Nicholson-Cole, S. (2009, March 1, 2009). “Fear won't do it”: Promoting positive engagement with climate change through visual and iconic representations. *Science Communication, 30*(3), 355-379. https://doi.org/10.1177/1075547008329201

Parkinson, J., David, P., & Rundle-Thiele, S. (2017). Self-efficacy or perceived behavioural control: Which influences consumers' physical activity and healthful eating behaviour maintenance? *Journal of Consumer Behaviour, 16*(5), 413-423. https://doi.org/http://10.1002/cb.1641

Pearce, R., Dessai, S., & Barr, S. (2013). Re-framing environmental social science research for sustainable water management in a change climate. *Water Resources Management*, *27*(1), 959-979. https://doi.org/10.1007/s11269-012-0184-0

Pedruzzi, R., Swinbourne, A. L., & Quirk, F. (2016). Fear campaigns and control appraisals: Creating messages that matter in road safety. *Road & Transport Research: A journal of Australian and New Zealand Research and Practice, 25*(3), 28-39.

Perrault, E. K., & Clark, S. K. (2018). Sustainability attitudes and behavioral motivations of college students: Testing the extended parallel process model. *International Journal of Sustainability in Higher Education, 19*(1), 32-47. https://doi.org/10.1108/IJSHE-09-2016-0175

Peters, G.-J. Y., Ruiter, R. A. C., & Kok, G. (2013). Threatening communication: a critical re-analysis and a revised meta-analytic test of fear appeal theory. *Health Psychology Review, 7*(sup1), S8-S31. https://doi.org/10.1080/17437199.2012.703527

Poortinga, W., & Darnton, A. (2016). Segmenting for sustainability: The development of a sustainability segmentation model from a Welsh sample. *Journal of Environmental Psychology, 45*, 221-232. https://doi.org/10.1016/j.jenvp.2016.01.009

Popova, L. (2012). The extended parallel process model: Illuminating the gaps in research. *Health Education & Behavior, 39*(4), 455-473. https://doi.org/10.1177/1090198111418108

Prochaska, J. O., Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of consulting and clinical psychology, 51*(3), 390-395. https://doi.org/10.1037//0022-006X.51.3.390

Prochaska, J. O., Velicer, W. F., Rossi, J. S., Goldstein, M. G., Marcus, B. H., Rakowski, W., Fiore, C., Harlow, L. L., Redding, C. A., Rosenbloom, D., & Rossi, S. R. (1994). Stages of change and decisional balance for 12 problem behaviors. *Health Psychology 13*(1), 39-46. https://doi.org/10.1037/0278-6133.13.1.39

Rigby, K., Brown, M., Anagnostou, P., Ross, M. W., & Rosser, B. R. S. (1989). Shock tactics to counter AIDS: The Australian experience. *Psychology & Health, 3*(3), 145-159. https://doi.org/10.1080/08870448908400375

Rimal, R. N., Brown, J., Mkandawire, G., Folda, L., Böse, K., & Creel, A. H. (2009). Audience segmentation as a social-marketing tool in health promotion: Use of the risk perception attitude framework in HIV prevention in Malawi. *American Journal of Public Health*, *99*(12), 2224-2229. https://doi.org/10.2105/AJPH.2008.155234

Rimal, R. N., & Real, K. (2003). Percieved risk and efficacy beliefs as motivators of change: The use of the risk perception attitude (RPA) framework to understand health behaviours. *Human Communication Research*, *29*(3), 370-399. https://doi.org/10.1111/j.1468-2958.2003.tb00844.x

Roberto, A. J., Mongeau, P. A., Liu, Y., & Hashi, E. C. (2019). "Fear the flu, not the flu shot": A test of the extended parallel process model. *Journal of Health Communication*, *24*(11), 829-836. https://doi.org/10.1080/10810730.2019.1673520

Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change1. *The Journal of Psychology*, *91*(1), 93-114. https://doi.org/10.1080/00223980.1975.9915803

Rogers, R. W. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In J. T. Cacioppo & R. E. Petty (Eds.), *Social Psychophysiology: A Sourcebook* (pp. 153-176). Guilford Press.

Ross, M. W., Rigby, K., Rosser, B. R. S., Anagnostou, P., & Brown, M. (1990). The effect of a national campaign on attitudes toward AIDS. *AIDS Care*, *2*(4), 339-346. https://doi.org/10.1080/09540129008257749

Ruiter, R. A. C., Abraham, C., & Kok, G. (2001). Scary warnings and rational precautions: A review of the psychology of fear appeals. *Psychology & Health*, *16*(6), 613-630. https://doi.org/10.1080/08870440108405863

Scannell, L., & Gifford, R. (2013). Personally relevant climate change: The role of place attachment and local versus global message framing in engagement *Environment and Behavior*, *45*(1), 60-85. https://doi.org/10.1177/0013916511421196

Schafer, M. S., & Schlichting, I. (2014). Media representations of climate change: A meta-analysis of the research field. *Environmental Communication, 8*(2), 142-160. https://doi.org/10.1080/17524032.2014.914050

Scharks, T. (2016). *Threatening messages in climate change communication* University of Washington]. https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/36393

Schneider, S., Gadinger, M., & Fischer, A. (2012). Does the effect go up in smoke? A randomized controlled trial of pictorial warnings on cigarette packaging. *Patient Education and Counseling, 86*(1), 77-83. https://doi.org/10.1016/j.pec.2011.03.005

Searle, K., & Gow, K. (2010). Do concerns about climate change lead to distress? *International Journal of Climate Change Strategies and Management, 2*(4), 362-379. https://doi.org/10.1108/17568691011089891

Shanahan, P., Dahlgren, N., & Elliot, B. (2000). Review of public information campaigns addressing youth risk-taking In *Australian Transport Index (ATRI)*. Australian Clearinghouse for Youth Studies (for the National Youth Affairs Research Scheme).

Silk, K. J., & Parrott, R. L. (2006). All or nothing... or just a hat? Farmers' sun protection behaviors. *Health Promotion Practice, 7*(2), 180-185. https://doi.org/10.1177/1524839905275401

Silk, K. J., Weiner, J., & Parrott, R. L. (2005). Gene cuisine or frankenfood? The theory of reasoned action as an audience segmentation strategy for messages about genetically modified foods. *Journal of Health Communication, 10*(8), 751-767. https://doi.org/10.1080/10810730500326740

Slater, M. D. (1995). Choosing audience segmentation strategies and methods for health communication. In E. Maibach & R. L. Parrott (Eds.), *Designing health messages:*

Approaches from communication theory and public health practice (pp. 186-197). Sage.

Slater, M. D. (1996). Theory and method in health audience segmentation. *Journal of Health Communication, 1*, 267-283. https://doi.org/10.1080/108107396128059

Smith, W. R. (1956). Product differentiation and market segmentation as alternative marketing strategies. *Journal of Marketing, 21*(1), 3-8. https://doi.org/10.2307/1247695

Spence, A., & Pidgeon, N. (2010). Framing and communicating climate change: The effects of distance and outcome frame manipulations. *Global Environmental Change, 20*(1), 656-667. https://doi.org/10.1016/j.gloenvcha.2010.07.002

Spence, A., Poortinga, W., Butler, C., & Pidgeon, N. F. (2011). Perceptions of climate change and willingness to save energy related to flood experience. *Nature Climate Change, 1*, 46-49. https://doi.org/10.1038/NCLIMATE1059

Spence, A., Poortinga, W., & Pidgeon, N. (2011). The psychological distance of climate change. . *Risk analysis, 32*(6), 957-972. https://doi.org/10.1111/j.1539-6924.2011.01695.x

Steffen, W., Hughes, L., Dean, A., & Rice, M. (2018). *Factsheet: Climate change and drought June 2018*. https://www.climatecouncil.org.au/wp-content/uploads/2018/06/CC_MVSA0146-Fact-Sheet-Drought_V2-FA_High-Res_Single-Pages.pdf

Stylianou, M. (2010, 2010/06). The return of the Grim Reaper: how memorability created mythology [Report]. *History Australia, 7*. http://link.galegroup.com.elibrary.jcu.edu.au/apps/doc/A224990341/AONE?u=james_cook&sid=AONE&xid=7fb9ef07

Syme, G. J., Nancarrow, B. E., & Seligman, C. (2000). The evaluation of information campaigns to promote voluntary household water conservation. *Evaluation Review, 24*(6), 539-578. https://doi.org/10.1177/0193841X0002400601

Talbot, C. J., Bennett, E. M., Cassell, K., Hanes, D. M., Minor, E. C., Paerl, H., Raymond, P. A., Vargas, R., Vidon, P. G., Wollheim, W., & Xenopoulos, M. A. (2018). The impact of flooding on aquatic ecosystem services. *Biogeochemistry, 141*, 439-461. https://doi.org/https://doi.org/10.1007/s10533-018-0449-7

Tay, R. (2005). Mass media campaigns reduce the incidence of drinking and driving. *Evidence-based Healthcare and Public Health, 9*(1), 26-29. https://doi.org/10.1016/j.ehbc.2004.11.013

Tay, R., & Watson, B. (2002). Changing drivers' intentions and behaviours using fear-based driver fatigue advertisments. *Health Marketing Quarterly, 19*(4), 55-68. https://doi.org/10.1300/J026v19n04_05

Taylor, B. (1987). NACAIDS campaign: Three months on.

Townsville City Council. (2016, 4 August). *Tougher water restrictions come into effect* [Media release]. https://www.townsville.qld.gov.au/about-council/news-and-publications/media-releases/2016/august/tougher-water-restrictions-come-into-effect

Townsville City Council. (2017). *Breaking ground on $215 million water pipeline* https://www.townsville.qld.gov.au/about-council/news-and-publications/media-releases/2017/november/breaking-ground-on-$215-million-water-pipeline

Townsville City Council. (2021). *Dam Levels*. Retrieved 20 August from https://www.townsville.qld.gov.au/water-waste-and-environment/water-supply-and-dams/dam-levels

Townsville City Council. (2022). *Dam Levels*. https://www.townsville.qld.gov.au/water-waste-and-environment/water-supply-and-dams/dam-levels

Trope, Y., & Liberman, N. (2003). Temporal construal. *Psychological Review, 110*(3), 403-421. https://doi.org/10.1037/0033-295X.110.3.403

Trope, Y., & Liberman, N. (2010). Construal level theory of psychological distance. *Psychological Review, 117*(2), 440-463. https://doi.org/10.1037/a0018963

UN Water. (2013). *Water security & the global water agenda: A UN-Water analytical brief.* UNU-INWEH. https://www.unwater.org/publications/water-security-global-water-agenda/

United Nations. (2013, para. 1). *UN-Water: Coordinating the UN's work on water and sanitation*. Retrieved September 23 from https://www.unwater.org/publications/water-security-infographic/

United Nations Department of Economic and Social Affairs (UNDESA). (n.d.). *Internation decade for action "Water for Life" 2005-2015*. Retrieved 18 November 2019 from https://www.un.org/waterforlifedecade/human_right_to_water.shtml

van der Linden, S., Maibach, E., & Leiserowitz, A. (2015). Improving public engagement with climate change: Five "best practice" insights from psychological science. *Perspectives on Psychological Science, 10*(6), 758-763. https://doi.org/10.1177/1745691615598516

Vorkinn, M., & Riese, H. (2001). Environmental concern in a local context: The significance of place attachment. *Environment and Behavior, 33*(2), 249-263. https://doi.org/10.1177/00139160121972972

Wakslak, C. J., Trope, Y., Liberman, N., & Alony, R. (2006). Seeing the forest when entry is unlikely: Probability and the mental representation of events. *Journal of Environmental Psychology: General, 135*(4), 641-653. https://doi.org/10.1037/0096-3445.135.4.641

Wallack, W. D. L. (1999). A critical perspective on the drug czar's antidrug media campaign. *Journal of Health Communication, 4*(2), 155-160. https://doi.org/10.1080/108107399127020

Walton, A., & Hume, M. (2011). Creating positive habits in water conservation: The case of the Queensland Water Commission and the Target 140 campaign. *International journal of nonprofit and voluntary sector marketing, 16*(3), 215-224. https://doi.org/10.1002/nvsm.421

Witte, K. (1992). Putting the fear back into fear appeals: The extended parallel process model. *Communication Monographs, 59*(4), 329-349. https://doi.org/10.1080/03637759209376276

Witte, K. (1994). Fear control and danger control: A test of the extended parallel process model (EPPM). *Communication Monographs, 61*(2), 113-134. https://doi.org/10.1080/03637759409376328

Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education & Behavior, 27*(5), 591-615. https://doi.org/10.1177/109019810002700506

Wu, C. S. T., Wong, H. T., Chou, L. Y., To, B. P. W., Lee, W. L., & Loke, A. Y. (2014). Correlates of protective motivation theory (PMT) to adolescents drug use intention. *International Journal of Environmental Research and Public Health, 11*(1), 671-684. https://doi.org/10.3390/ijerph110100671

Xue, W., Hine, D. W., Marks, A. D. G., Phillips, W. J., Nunn, P., & Zhao, S. (2016). Combining threat and efficacy messaging to increase public engagement with climate change in Beijing, China. *Climatic Change, 137*(1), 43-55. https://doi.org/10.1007/s10584-016-1678-1

Zaalberg, R., Midden, C., Meijnders, A., & McCalley, T. (2009). Preventation, adaption, and threat denial: Flooding experiences in the Netherlands. *Risk analysis, 29*(12), 1759-1778. https://doi.org/10.1111/j.1539-6924.2009.01316.x

Appendices

11.1 Appendix A

11.1.1 Study 1 Survey

Investigating Townsville resident's water usage, attitudes, beliefs and behaviours

My name is Madelyn Pardon and I am a postgraduate research student at James Cook University. I would like to invite you to take part in my research project investigating water conservation behaviour in the Townsville region. In this research, I am interested in understanding the common beliefs, attitudes and thoughts among the residents of Townsville and how these characteristics influence how people use water. The study is also being conducted by Dr Anne Swinbourne and Dr Connar McShane and will contribute to my thesis for my Masters of Philosophy (Research) at James Cook University. If you would like to participate in this study, you will be invited to fill out a questionnaire. With your consent, the questionnaire will enquire about your water usage behaviour, your perceptions relating to how the water restrictions have been communicated to you, as well as your concerns regarding the issue at present and in the future. The questionnaire should only take approximately 15 minutes of your time to complete. Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. You can stop taking part in the survey by exiting the web page. By completing this questionnaire you are consenting to participate in this study. The data from the study will be used in research publications and reports as part of my postgraduate research. A summary report of my findings will also be posted on community boards such as the 'Townsville Water Usage survey' Facebook page. Because we never ask for your name, your responses will be completely unidentifiable in these reports and publications.

Please indicate below whether you give your consent to participate in this study. Pressing ‘AGREE’ will take you to the beginning of the survey. Pressing ‘DO NOT AGREE’ will exit you from the survey.

If you have any questions about the study, please contact either Madelyn Pardon, Dr Anne Swinbourne or Dr Connar McShane.

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- ☐ AGREE (1)
- ☐ DO NOT AGREE (2)

Skip To: Q29 If My name is Madelyn Pardon and I am a postgraduate research student at James Cook University. I wo... = DO NOT AGREE

Q2 Do you currently live in Townsville?

- O Yes (1)
- O No (2)

Skip To: Q29 If Do you currently live in Townsville? = No

Q3 From the list below please indicate the Townsville suburb where your current main residence is located. If your location is not in the list below, please write the location in the comments box.

- O Aitkenvale (1)
- O Alice River (2)
- O Annandale (3)
- O Belgian Gardens (4)
- O Bluewater (5)
- O Bushland Beach (6)
- O Cluden (7)
- O Condon (8)
- O Cranbrook (9)
- O Deeragun (10)
- O Douglas (including University campuses) (11)
- O Garbutt (12)
- O Gulliver (13)
- O Heatley (14)
- O Hermit Park (15)
- O Hyde Park (16)
- O Idalia (17)
- O Kelso (18)
- O Kirwan (19)
- O Magnetic Island (20)
- O Mount Louisa (21)
- O Mundingburra (22)
- O Mysterton (23)
- O North Ward (24)
- O Oonoonba (25)
- O Pallarenda (26)
- O Pimlico (27)

- Railway Estate (28)
- Rasmussen (29)
- Rowes Bay (30)
- Saunders Beach (31)
- South Townsville (32)
- Stuart (33)
- Thuringowa (34)
- Toolakea (35)
- Vincent (36)
- West End (37)
- Woodstock (38)
- Wulguru (39)
- Yabulu (40)
- Other (41) ____________________

Q4 How long have you lived in Townsville? (in years)

Q5 What is your gender?

- Male (1)
- Female (2)
- Other (3)

Q6 What was your age (in years) at your last birthday?

Q7 Are you a home owner?

- Yes (1)
- No (2)

Skip To: Q10 If Are you a home owner? = Yes

Skip To: Q8 If Are you a home owner? = No

Q8 Does your residence have an automatic watering system?

- Yes (1)
- No (2)

Skip To: Q10 If Does your residence have an automatic watering system? = No

Skip To: Q9 If Does your residence have an automatic watering system? = Yes

Q9 Do you have control over the automatic watering system? (i.e. are you able to switch it off and on?)

- Yes (1)
- No (2)

Q10 How many adults currently regularly occupy the home you live in?

Q11 How many children (i.e. under 18 years) currently regularly occupy the home you live in?

The next set of questions specifically deal with the region of Townsville and Townsville's water supply.

Q12 From the list below, what level of water restrictions are currently in place in the Townsville region?

- Level 1 (1)
- Level 2 (2)
- Level 3 (3)
- Level 4 (4)

Q13 Please select all the items in the list below that you believe are required under the current water restrictions. (Tick all that apply)

- No sprinkler or irrigation system (1)
- Hand-held watering only (between certain hours) (2)
- Showers for no longer than five minutes (3)
- The use of buckets, watering cans and drip irrigation systems at any time (4)
- No automatic watering systems (5)
- No dish-washing machines (6)
- The use of a broom to clean hard surfaces (not a hose) (7)
- The use of a bucket for washing animals (between certain hours) (8)
- The use of a bucket to wash or clean vehicles (9)
- Sprinklers can be used at any time (10)
- None of the above (11)

Q14 Please indicate your level of agreement with the following statement:"I am more concerned about Townsville's water supply than I was..."

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Six months ago (1)	O	O	O	O	O
One year ago (2)	O	O	O	O	O
Three years ago (3)	O	O	O	O	O

Q15 Please indicate how likely you think...

	Extremely unlikely (1)	Unlikely (2)	Neutral (3)	Likely (4)	Extremely likely (5)
Your current efforts will help minimise the water supply problem (1)	O	O	O	O	O
The Townsville community's current efforts will help minimise the water supply problem (2)	O	O	O	O	O
The Townsville City Council's current efforts will help minimise the water supply problem (3)	O	O	O	O	O
The State Government's current efforts will help minimise the water supply problem (4)	O	O	O	O	O

Q16 It has often been asked who is responsible for securing Townsville's water supply. Below are some options. Please indicate the level of responsibility you think each has for solving the current water supply issue in the Townsville region.

	Not at all responsible (1)	Somewhat responsible (2)	Neutral (3)	Mostly responsible (4)	Completely responsible (5)
You (1)	O	O	O	O	O
The general public of Townsville (2)	O	O	O	O	O
The Townsville City Council (3)	O	O	O	O	O
The State Government (4)	O	O	O	O	O

Q17 Please indicate your level of agreement with the following statements: "Townsville is in drought because..."

	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
Of human caused climate change (1)	O	O	O	O	O
This is a sign of a permanent shift in weather patterns (2)	O	O	O	O	O
This is just part of nature's natural cycle (3)	O	O	O	O	O
The people of Townsville waste water (4)	O	O	O	O	O
Of poor planning by the Townsville City Council (e.g. infrastructure and funding) (5)	O	O	O	O	O
Of poor planning by the State Government (e.g. infrastructure and funding) (6)	O	O	O	O	O
The Townsville City Council wastes water (7)	O	O	O	O	O

Q18 The lack of water supply is considered to negatively impact the local region. Please indicate the level of negative impact you believe Townsville's current diminishing water supply has on each of the groups below.

	No negative impact (1)	Slight negative impact (2)	Moderate negative impact (3)	Great negative impact (4)	Extreme negative impact (5)
You personally (1)	O	O	O	O	O
Your family and friends (2)	O	O	O	O	O
The city of Townsville (3)	O	O	O	O	O
The environment (4)	O	O	O	O	O

Q19 How satisfied are you with the **amount** of information you have been given regarding water restrictions in the Townsville region?

- O Extremely dissatisfied (1)
- O Dissatisfied (2)
- O Neither satisfied nor dissatisfied (3)
- O Satisfied (4)
- O Extremely satisfied (5)

Q20 How satisfied are you with the **quality** of information you have been given regarding water restrictions in the Townsville region?

- O Extremely dissatisfied (1)
- O Dissatisfied (2)
- O Neither satisfied nor dissatisfied (3)
- O Satisfied (4)
- O Extremely satisfied (5)

Q21 From which sources have you received water information about the Townsville region? Tick all that apply.

- ▢ Television (1)
- ▢ Radio (2)
- ▢ Local paper (e.g. Townsville Bulletin) (3)
- ▢ Facebook (4)
- ▢ Twitter (5)
- ▢ Billboards (6)
- ▢ Mailbox drop (e.g. pamphlets from the Townsville City Council) (7)
- ▢ I have not received any information (8)
- ▢ Other (9) ____

Q22 Do you think there is room for improvement regarding the water information you currently receive?

- O Yes (1)
- O No (2)

Skip To: Q25 If Do you think there is room for improvement regarding the water information you currently receive? = No

Q22 In your own words, how could the information about the water restrictions in the Townsville region be improved? (Optional)

____

____

The next set of questions are in relation to how you use water in your home and how you feel about water-saving behaviours.

Q25 Do you have a bore water system installed at your current residence?

O Yes (1)

O No (2)

Q26 Have you stopped watering your yard completely as a result of the water restrictions?

O Yes (1)

O No (2)

Q27 In the past year, have the water restrictions caused you to...

	Never (1)	Almost never (2)	Sometimes (3)	Almost always (4)	Always (5)	Not applicable (6)
Shorten your shower time? (1)	O	O	O	O	O	O
Continue to water your lawn using sprinklers or irrigation systems? (2)	O	O	O	O	O	O
Encourage your family and friends to use less water? (3)	O	O	O	O	O	O
Install the latest water saving devices or fittings (e.g. hoses and/or shower fittings)? (4)	O	O	O	O	O	O
Check taps for leaks? (5)	O	O	O	O	O	O
Use a broom instead of a hose to clean hard surfaces? (6)	O	O	O	O	O	O
Water the lawn and/or garden only in the Council's allocated times? (7)	O	O	O	O	O	O
Use a bucket to wash the car instead of the hose? (8)	O	O	O	O	O	O
Stop using sprinkler and irrigation systems? (9)	O	O	O	O	O	O
Plant drought resistant plants/turf? (10)	O	O	O	O	O	O
Educate someone on water-saving behaviour or on the current water restrictions? (11)	O	O	O	O	O	O
Join a local water-saving group? (12)	O	O	O	O	O	O
Support a government body, industry body or	O	O	O	O	O	O

local business because of their water-saving solutions? (13)						
Wash the car using a hose? (14)	O	O	O	O	O	O
Turn the tap off while brushing your teeth? (15)	O	O	O	O	O	O
Continue to water outside the allocated time-slots? (16)	O	O	O	O	O	O
Use a hose to clean hard surfaces? (17)	O	O	O	O	O	O
Report a neighbour for watering their lawn outside the restriction times? (18)	O	O	O	O	O	O

Q28 Please indicate your level of agreement with the following statements below regarding water-saving behaviour.

	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
I do not have enough time to engage in water-saving behaviour (1)	O	O	O	O	O
I do not have confidence in my ability or capacity to engage in water-saving behaviour (2)	O	O	O	O	O
I do not think water-saving behaviour is important (3)	O	O	O	O	O
I do not think my water-saving will make a substantial positive difference for me personally (4)	O	O	O	O	O
I do not think my water-saving will make a substantial positive difference for future generations (5)	O	O	O	O	O

I do not think my water-saving will make a substantial positive difference for the city of Townsville (6)	O	O	O	O	O
I do not think my water-saving will make a substantial positive difference for the environment (7)	O	O	O	O	O
There is a lack of financial incentives for me to participate in water-saving behaviour (8)	O	O	O	O	O
My family does not encourage water-saving behaviours (9)	O	O	O	O	O
My work colleagues do not encourage water-saving behaviours (10)	O	O	O	O	O
My neighbours do not encourage water-saving behaviours (11)	O	O	O	O	O
I have the knowledge to be able to adjust my behavior to help minimise the water issue in the Townsville region (12)	O	O	O	O	O
I know what I can do to help minimise the water issue in the Townsville region (13)	O	O	O	O	O
I have access to all the tools and assistance I need to help minimise the water issue in the Townsville region (14)	O	O	O	O	O
I think other people do not follow the water restrictions (15)	O	O	O	O	O
I want my house and yard to look nice (i.e. green grass) (16)	O	O	O	O	O
I do not believe Townsville is in drought (17)	O	O	O	O	O

The next set of questions are general questions about the environment. Although not directly related to Townsville and the water issue, we are interested in the broader attitudes about environmental issues held by the community.

Q29 Listed below are statements about the relationship between humans and the environment. For each one, please indicate your level of agreement

	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
We are approaching the limit of the number of people the earth can support (1)	O	O	O	O	O
Humans have the right to modify the natural environment to suit their needs (2)	O	O	O	O	O
When humans interfere with nature it often produces disastrous consequences (3)	O	O	O	O	O
Human ingenuity will ensure that we do NOT make the earth unlivable (4)	O	O	O	O	O
Humans are severely abusing the environment (5)	O	O	O	O	O
The earth has plenty of natural resources if we just learn how to develop them (6)	O	O	O	O	O
Plants and animals have as much right as humans to exist (7)	O	O	O	O	O
The balance of nature is strong enough to cope with the impacts of modern industrial nations (8)	O	O	O	O	O
Despite our special abilities humans are still subject to the laws of nature (9)	O	O	O	O	O

The so-called "ecological crisis" facing humankind has been greatly exaggerated (10)	O	O	O	O	O
The earth is like a spaceship with limited room and resources (11)	O	O	O	O	O
Humans were meant to rule over the rest of nature (12)	O	O	O	O	O
The balance of nature is very delicate and easily upset (13)	O	O	O	O	O
Humans will eventually learn enough about how nature works to be able to control it (14)	O	O	O	O	O
If things continue on their present course, we will soon experience a major ecological catastrophe (15)	O	O	O	O	O

Thank you for participating in my survey. If you have any questions about the study, please contact either Madelyn Pardon, Dr Anne Swinbourne or Dr Connar McShane.

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If you would like more information regarding Townsville water restrictions, please visit the Townsville City Council's website below.
https://www.townsville.qld.gov.au/water-waste-and-environment/water-supply-and-dams/restrictions

11.2 Appendix B

11.2.1 Study 1 Ethics Approval

This administrative form has been removed

11.3 Appendix C

11.3.1 Study 1 Information Sheet

JAMES COOK UNIVERSITY
AUSTRALIA

INFORMATION SHEET

PROJECT TITLE: Investigating Townsville residents water usage attitudes, beliefs and behaviours.

My name is Madelyn Pardon and I am a postgraduate research student at James Cook University. I would like to invite you to take part in my research project investigating water conservation behaviour in the Townsville region. In this research, I am interested in understanding the common beliefs, attitudes and thoughts among the residents of Townsville and how these characteristics influence how people use water.

The study is also being conducted by Dr Anne Swinbourne and Dr Connar McShane and will contribute to my Thesis for my Masters of Philosophy (Research) at James Cook University.

If you would like to participate in this study, you will be invited to fill out a questionnaire. With your consent, the questionnaire will enquire about your water usage behaviour, your perceptions relating to how the water restrictions have been communicated to you, as well as your concerns regarding the issue at present and in the future. The questionnaire should only take approximately 15 minutes of your time to complete.

Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. By completing this questionnaire you are consenting to participate in this study.

The data from the study will be used in research publications and reports as part of my Postgraduate Research. Your responses will be completely unidentifiable in these reports and publications.

Thank you for your interest in completing this questionnaire and contributing to my Research Project. Your time is greatly appreciated. If you know anyone else that would be interested in participating, in the Townsville region, could you please let them know about this study.

Below is the link to the survey:

XXXX

If you have any questions about the study, please contact **Madelyn Pardon** or **Anne Swinbourne.**

Principal Investigator:	**Supervisor:**
Madelyn Pardon	**Dr Anne Swinbourne**
College of Healthcare Sciences	**College of Healthcare Sciences**
James Cook University	**James Cook University**
Phone:	**Phone:**
Email: madelyn.pardon@my.jcu.edu.au	**Email: anne.swinbourne@jcu.edu.au**

11.4 Appendix D

Table 27

Reported Percentages of Agreement with Behaviour Barrier Statements for the Total Sample

Behaviour barrier question	Strongly agree/agree %	Neutral %	Strongly disagree/ disagree %
I do not have enough time to engage in water-saving behaviour	14.9	20.9	64.2
I do not have confidence in my ability or capacity to engage in water-saving behaviour	8.8	14.9	76.3
I do not think water-saving behaviour is important	7.5	11.8	80.2
I do not think my water-saving will make a substantial positive difference for me personally	32.2	17.6	50.2
I do not think my water-saving will make a substantial positive difference for future generations	31.4	16.8	51.8
I do not think my water-saving will make a substantial positive difference for the city of Townsville	33.1	19.6	47.2
I do not think my water-saving will make a substantial positive difference for the environment	32.7	19.8	47.4

Behaviour barrier question	Strongly agree/agree %	Neutral %	Strongly disagree/ disagree %
There is a lack of financial incentives for me to participate in water-saving behaviour	47.4	24.8	27.5
My family does not encourage water-saving behaviours	11.3	19.6	69.1
My work colleagues do not encourage water-saving behaviours	17.3	34.7	48.0
My neighbours do not encourage water-saving behaviours	25.1	28.9	45.8
I have the knowledge to be able to adjust my behaviour to help minimise the water issue in the Townsville region	74.6	18.2	7.2
I know what I can do to help minimise the water issue in the Townsville region	70.8	17.9	11.0
I have access to all the tools and assistance I need to help minimise the water issue in the Townsville region	43.8	30.6	25.6
I think other people do not follow the water restrictions	68.6	22.6	8.0
I want my house and yard to look nice (i.e. green grass)	71.4	17.6	17.6
I do not believe Townsville is in drought	4.7	5.5	89.3

11.5 Appendix E

11.5.1 Study 1 Regression Analysis Output

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.309[a]	.096	.084	12.91260	.096	8.502	4	322	<.001
2	.394[b]	.155	.142	12.49790	.060	22.724	1	321	<.001
3	.549[c]	.301	.286	11.40546	.146	33.218	2	319	<.001

a. Predictors: (Constant), Are you a home owner?, What is your gender?, How long have you lived in Townsville? (in years), What was your age (in years) at your last birthday?

b. Predictors: (Constant), Are you a home owner?, What is your gender?, How long have you lived in Townsville? (in years), What was your age (in years) at your last birthday?, Threat

c. Predictors: (Constant), Are you a home owner?, What is your gender?, How long have you lived in Townsville? (in years), What was your age (in years) at your last birthday?, Threat, Resp_Eff, Self_Eff

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5670.139	4	1417.535	8.502	<.001[b]
	Residual	53688.730	322	166.735		
	Total	59358.869	326			
2	Regression	9219.502	5	1843.900	11.805	<.001[c]
	Residual	50139.366	321	156.197		
	Total	59358.869	326			
3	Regression	17861.882	7	2551.697	19.616	<.001[d]
	Residual	41496.987	319	130.085		
	Total	59358.869	326			

a. Dependent Variable: TOTAL_BEH

b. Predictors: (Constant), Are you a home owner?, What is your gender?, How long have you lived in Townsville? (in years), What was your age (in years) at your last birthday?

c. Predictors: (Constant), Are you a home owner?, What is your gender?, How long have you lived in Townsville? (in years), What was your age (in years) at your last birthday?, Threat

d. Predictors: (Constant), Are you a home owner?, What is your gender?, How long have you lived in Townsville? (in years), What was your age (in years) at your last birthday?, Threat, Resp_Eff, Self_Eff

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound	Correlations Zero-order	Correlations Partial	Correlations Part
1	(Constant)	33.470	5.329		6.280	<.001	22.985	43.954			
	How long have you lived in Townsville? (in years)	.051	.055	.058	.941	.347	-.056	.159	.146	.052	.050
	What is your gender?	6.530	1.529	.227	4.271	<.001	3.522	9.537	.214	.232	.226
	What was your age (in years) at your last birthday?	.179	.064	.208	2.792	.006	.053	.305	.200	.154	.148
	Are you a home owner?	.923	2.058	.031	.449	.654	-3.125	4.972	-.103	.025	.024
2	(Constant)	18.814	6.005		3.133	.002	7.000	30.627			
	How long have you lived in Townsville? (in years)	.037	.053	.041	.695	.488	-.067	.141	.146	.039	.036
	What is your gender?	5.269	1.503	.183	3.506	<.001	2.312	8.226	.214	.192	.180
	What was your age (in years) at your last birthday?	.151	.062	.176	2.422	.016	.028	.273	.200	.134	.124
	Are you a home owner?	1.393	1.994	.047	.699	.485	-2.530	5.317	-.103	.039	.036
	Threat	4.836	1.015	.254	4.767	<.001	2.840	6.832	.314	.257	.245
3	(Constant)	1.259	6.370		.198	.843	-11.273	13.790			
	How long have you lived in Townsville? (in years)	.077	.048	.086	1.587	.114	-.018	.172	.146	.088	.074
	What is your gender?	4.395	1.376	.153	3.193	.002	1.687	7.103	.214	.176	.149
	What was your age (in years) at your last birthday?	.114	.057	.133	1.998	.047	.002	.227	.200	.111	.094
	Are you a home owner?	.691	1.842	.023	.375	.708	-2.932	4.315	-.103	.021	.018
	Threat	4.644	.927	.244	5.012	<.001	2.821	6.467	.314	.270	.235
	Self_Eff	2.409	.949	.127	2.538	.012	.541	4.277	.256	.141	.119
	Resp_Eff	4.062	.595	.336	6.833	<.001	2.893	5.232	.363	.357	.320

a. Dependent Variable: TOTAL_BEH

11.6 Appendix F

11.6.1 Study 1 R Analysis Code

```
>library(haven)

>ClusterMads <- read_sav("C:/Users/jc244076/Desktop/Mads/ClusterMads.sav")

?View(ClusterMads)

>library(flexclust)

>library(cclust)

>Cluster = data.frame(ClusterMads$ZThreat, ClusterMads$ZSelfEff,
ClusterMads$ZRespEff)

>View(Cluster)

>#done with 3 clusters#

>set.seed(1234)

>waterkm3 <- stepcclust(Cluster, k=3, nrep=10)

>barchart(waterkm3)

>waterkm3@cluster

>waterkm3@centers
```

11.7 Appendix G

11.7.1 Study 1 Regression Analysis Output

Descriptive Statistics

	Mean	Std. Deviation	N
TOTAL_BEH	54.0979	13.49379	327
How long have you lived in Townsville? (in years)	19.1997	15.13716	327
What is your gender?	1.67	.470	327
What was your age (in years) at your last birthday?	42.1223	15.71361	327
Are you a home owner?	1.29	.455	327
cluster 1	.3303	.47103	327
cluster 2	.2324	.42302	327

Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.309[a]	.096	.084	12.91260	.096	8.502	4	322	<.001
2	.481[b]	.231	.217	11.94263	.136	28.214	2	320	<.001

a. Predictors: (Constant), Are you a home owner?, What is your gender?, How long have you lived in Townsville? (in years), What was your age (in years) at your last birthday?

b. Predictors: (Constant), Are you a home owner?, What is your gender?, How long have you lived in Townsville? (in years), What was your age (in years) at your last birthday?, cluster 2, cluster 1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5670.139	4	1417.535	8.502	<.001[b]
	Residual	53688.730	322	166.735		
	Total	59358.869	326			
2	Regression	13718.404	6	2286.401	16.031	<.001[c]
	Residual	45640.465	320	142.626		
	Total	59358.869	326			

a. Dependent Variable: TOTAL_BEH

b. Predictors: (Constant), Are you a home owner?, What is your gender?, How long have you lived in Townsville? (in years), What was your age (in years) at your last birthday?

c. Predictors: (Constant), Are you a home owner?, What is your gender?, How long have you lived in Townsville? (in years), What was your age (in years) at your last birthday?, cluster 2, cluster 1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	33.470	5.329		6.280	<.001	22.985	43.954			
	How long have you lived in Townsville? (in years)	.051	.055	.058	.941	.347	-.056	.159	.146	.052	.050
	What is your gender?	6.530	1.529	.227	4.271	<.001	3.522	9.537	.214	.232	.226
	What was your age (in years) at your last birthday?	.179	.064	.208	2.792	.006	.053	.305	.200	.154	.148
	Are you a home owner?	.923	2.058	.031	.449	.654	-3.125	4.972	-.103	.025	.024
2	(Constant)	43.105	5.093		8.463	<.001	33.084	53.125			
	How long have you lived in Townsville? (in years)	.070	.051	.079	1.386	.167	-.029	.170	.146	.077	.068
	What is your gender?	5.257	1.424	.183	3.691	<.001	2.455	8.059	.214	.202	.181
	What was your age (in years) at your last birthday?	.130	.060	.152	2.165	.031	.012	.249	.200	.120	.106
	Are you a home owner?	.771	1.912	.026	.403	.687	-2.991	4.533	-.103	.023	.020
	cluster 1	-10.924	1.567	-.381	-6.973	<.001	-14.006	-7.842	-.336	-.363	-.342
	cluster 2	-8.703	1.742	-.273	-4.997	<.001	-12.129	-5.276	-.090	-.269	-.245

a. Dependent Variable: TOTAL_BEH

11.8 Appendix H

Table 28

Percentage of Cluster that Correctly Indicated Level 3 Water Restriction Behaviour

Behaviour		Cluster 1	Cluster 2	Cluster 3
			Percentage (%)	
TCC enforced behaviour	No sprinkler or irrigation system	83.80	88.90	89.10
	Hand-held watering only (between certain hours)	91.50	90.00	93.60
	No automatic watering systems	76.10	85.60	84.60
	The use of a broom to clean hard surfaces (not a hose)	54.70	73.30	80.80
	The use of a bucket to wash or clean vehicles	70.10	80.00	82.70
Non-TCC enforced behaviour	Showers for no longer than five minutes	12.80	11.10	18.60
	The use of buckets, watering cans and drop irrigation systems at any time	37.60	55.60	53.80
	No dish-washing machines	1.70	0.00	1.30
	The use of a bucket for washing animals	15.40	13.30	21.80
	Sprinklers can be used at any time	1.70	1.10	2.60

11.9 Appendix I

11.9.1 Study 2 Survey

Out of sight, out of mind? Investigating how people think about water

My name is Madelyn Pardon and I am a PhD student at James Cook University. I would like to invite you to take part in my research project investigating the drivers of water security behaviour. In this research, I am interested in understanding how a person's perceptions and decisions differ when exposed to varying levels of water insecurity.

This study is also being conducted by Dr Anne Swinbourne and Dr Connar McShane and will contribute to my Thesis for my Philosophy Doctorate at James Cook University.

If you would like to participate in this study, you will be invited to read two hypothetical scenarios and fill out a questionnaire. With your consent, the questionnaire will enquire about your concerns regarding water availability, what information you find more useful when making decisions about your water use and water usage behaviour. The questionnaire should only take 20 minutes of your time to complete.

Taking part in the study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. You can stop taking part in the study by exiting the web page. By completing the questionnaire, you are consenting to participate in the study. The data from the study will be used in research publications and reports as part of my postgraduate research. Your responses will be completely unidentifiable in these reports and publications. At no stage do we ask for any identifying information from you.

Please indicate below whether you give your consent to participate in this study.

Pressing **AGREE** will take you to the beginning of the survey.
Pressing **DO NOT AGREE** will exit you from the survey.

If you have any questions about the study, please contact **Madelyn Pardon** or **Dr Anne Swinbourne.**

Supervisor
Anne Swinbourne
College of Healthcare Sciences
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Principal Investigator
Madelyn Pardon
College of Healthcare Sciences
James Cook University
Email: madelyn.pardon@my.jcu.edu.au

O **AGREE** (1)

O **DO NOT AGREE** (2)

Skip To: End of Survey If Out of sight, out of mind? Investigating how people think about water My name is Madelyn Pardo... = DO NOT AGREE

Q2 Do you currently reside in Australia?

- O Yes (1)
- O No (2)

Skip To: End of Survey If Do you currently reside in Australia? = No

Q3 In which state/territory do you live in?

- O Queensland (1)
- O New South Wales (2)
- O Australian Capital Territory (3)
- O Western Australia (4)
- O Northern Territory (5)
- O Tasmania (6)

Q4 What is your postcode?

Q5 What is the name of the city, town or community in which you reside?

Q6 What is your age to the closest year?

Q7 What is your gender?

- O Male (1)
- O Female (2)
- O Other (3)

Q8 Are you a home owner?

- O Yes (1)
- O No (2)

Q9 Have you ever experienced water security issues (for example, has a town you have lived in/are currently living in, been drought declared, was the local dam at a low capacity, etc.)?

O Yes (1)

O No (2)

Skip To: Pre-test If Have you ever experienced water security issues (for example, has a town you have lived in/are cu... = No

Q10 Please describe the water security issue you experienced below (for example, was your city drought declared, was the local dam at a low capacity etc.?)

Q11 Please indicate the city, town or community where you experienced water security issues.

Q12 Please give your best estimate of the first year you experienced the water security issues.

Q13 Please indicate approximately how long the water security issue lasted.

Pre-test
Water security issues in Australia are often considered to have a number of negative impacts (for example, water restrictions being enforced on a community).

The next set of questions asks about your perceptions of the CURRENT negative impacts as a result of water security issues in Australia.

Q14
Please indicate how much you think the negative impacts (for example, water restrictions) are **likely** to effect the options below.

On the scale below, 1 represents "Not likely at all to be effected" and 7 represents "Extremely likely to be effected".

	1 (Not likely at all) (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (Extremely likely) (7)
You personally (1)	O	O	O	O	O	O	O
Your friends and family (2)	O	O	O	O	O	O	O
The people in your current city/town (3)	O	O	O	O	O	O	O
Your current city/town (i.e. economically/environmentally etc.) (4)	O	O	O	O	O	O	O
People nationally within Australia (5)	O	O	O	O	O	O	O
Australia as a nation (i.e. economically/environmentally etc.) (6)	O	O	O	O	O	O	O

Q15
Please indicate how much you think the negative impacts (for example, water restrictions) would **negatively effect** the options below.

On the scale below, 1 represents "The negative impacts do not negatively effect this option at all" and 7 represents "The negative impacts have extreme negative effects for this option".

	1 (No negative effect) (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (Extreme negative effect) (7)
You personally (1)	O	O	O	O	O	O	O
Your friends and family (2)	O	O	O	O	O	O	O
People in your current city/town (3)	O	O	O	O	O	O	O
Your current city/town (i.e. economically/environmentally etc.) (4)	O	O	O	O	O	O	O
People nationally within Australia (5)	O	O	O	O	O	O	O
Australia (i.e. economically/environmentally etc.) (6)	O	O	O	O	O	O	O

Q16 It has been stated that various regions in Australia are experiencing water insecurity. Please indicate how much you agree with each of the following statements.

	Strongly disagree (1)	Disagree (2)	Slightly disagree (3)	Neither disagree or agree (4)	Slightly agree (5)	Agree (6)	Strongly agree (7)
I have confidence in my ability and capacity to engage in water saving behaviour (1)	o	o	o	o	o	o	o
I have the knowledge to be able to adjust my behaviour to help minimise the stress on the water supply in Australia (2)	o	o	o	o	o	o	o
I know what I can do to help minimise the water supply stress in Australia (3)	o	o	o	o	o	o	o
I have access to the tools and assistance I need to help minimise the stress on the water supply in Australia (4)	o	o	o	o	o	o	o
I believe my current efforts will help minimise the stress to the water supply in Australia (5)	o	o	o	o	o	o	o
I think conserving water will make a substantial positive difference for Australia's water supply (6)	o	o	o	o	o	o	o
I think the actions recommended by the State and Local Governments to conserve water will help minimise the stress to the water supply in Australia (7)	o	o	o	o	o	o	o
I think if I adopt the water conservation behaviours recommended by State and Local Governments, it will make a substantial positive difference for Australia's water supply (8)	o	o	o	o	o	o	o

End of Block: Introduction and Pre-test

Start of Block: Section 3a: Scenario 1

Section 3a
Please read the following scenario and imagine that you are currently experiencing the situation described. Keep in mind that each scenario you are presented will be different, so please read carefully. The questions immediately after this scenario pertain only to this scenario.

Scenario 1
Currently your town, $[Q5/ChoiceTextEntryValue] **is experiencing a major water security issue. The town,** $[Q5/ChoiceTextEntryValue]**, is the only community experiencing water insecurity to this degree in Australia. Your town,** $[Q5/ChoiceTextEntryValue], **has not experienced substantial rain in over 4 years. It is predicted that the community in** $[Q5/ChoiceTextEntryValue], **will remain on water restrictions for a substantial period. These local laws mean you are not allowed to wash your car or water your yard. Water usage of all residents is monitored and will be monitored for several years by the local Council. It will soon be required by the local Government that all residents will need to invest in water-saving shower heads and sprinklers.**

Q17
Please indicate how much you think the negative impacts (water restrictions, monitoring of water use and required investment in water saving devices) are **likely** to effect the options below.
On the scale below, 1 represents "Not likely at all to be effected" and 7 represents "Extremely likely to be effected".

	1 (Not likely at all) (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (Extremely likely) (7)
You personally (1)	O	O	O	O	O	O	O
Your friends and family (2)	O	O	O	O	O	O	O
People in your current city/town (3)	O	O	O	O	O	O	O
Your current city/town (i.e. economically/environmentally etc.) (4)	O	O	O	O	O	O	O
People nationally within Australia (5)	O	O	O	O	O	O	O
Australia (i.e. economically/environmentally etc.) (6)	O	O	O	O	O	O	O

Q18 If this was a real life scenario, please indicate how much you think the negative effects described in the scenario (water restrictions, monitoring of water use and required investment in water saving devices) would **negatively effect** the following:

On the scale below, 1 represents "The negative impacts do not negatively effect this option at all" and 7 represents "The negative impacts have extreme negative effects for this option".

	1 (No negative effect) (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (Extreme negative effect) (7)
You personally (1)	O	O	O	O	O	O	O
Your friends and family (2)	O	O	O	O	O	O	O
People in your current city/town (3)	O	O	O	O	O	O	O
Your current city/town (i.e. economically/environmentally etc.) (4)	O	O	O	O	O	O	O
People nationally within Australia (5)	O	O	O	O	O	O	O
Australia (i.e. economically/environmentally etc.) (6)	O	O	O	O	O	O	O

Q19 Please indicate the level of **threat** each option below would experience as a result of the negative impacts of this water security issue:
On the scale below, 1 represents "Extremely threatened and 7 represents "Not threatened at all".

	1 (Extremely threatened) (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (Not threatened at all) (7)
Your personal finances (1)	O	O	O	O	O	O	O
Your right to water (2)	O	O	O	O	O	O	O
Your community's resource (water) (3)	O	O	O	O	O	O	O
The country's natural resource (water) (4)	O	O	O	O	O	O	O
The global environment (5)	O	O	O	O	O	O	O
Your health (6)	O	O	O	O	O	O	O
The aesthetics of your property (7)	O	O	O	O	O	O	O
The aesthetics of your community (8)	O	O	O	O	O	O	O
Personal hygiene (9)	O	O	O	O	O	O	O
Ability to partake in recreational activities (accessing pools, water parks, etc.) (10)	O	O	O	O	O	O	O

Q20
Rank which statements you think were most influential/important to you for making decisions about the questions you answered previously about the scenario.
1 being the most influential/important and 4 being the least influential/important.

Click and move questions to indicate rank.
$[Q5/ChoiceTextEntryValue] is experiencing a major water security issue (1)
$[Q5/ChoiceTextEntryValue] is the only community experiencing water insecurity to this degree in Australia (2)
$[Q5/ChoiceTextEntryValue] has not experienced substantial rain in over 4 years (3)
It is predicted that $[Q5/ChoiceTextEntryValue] will remain on water restrictions for a substantial period (4)

Research states that the characteristics of a situation play a large role in the decisions we make about how to act in a particular situation. Research suggests that at any given point we either think about HOW we can do a behaviour or we may choose to go further and think about WHY the behaviour is important. Each option may be more or less appropriate at any one time.

To remind you of the scenario we are talking about, it is represented below. It is followed by questions which give you two options. One reflects the HOW TO line of thinking. The other the WHY AM I DOING THIS line of thought. Out of the two options for each question below, indicate which statement you think best reflects your behaviour if you were faced with these situations.

SCENARIO: Currently your town, $[Q5/ChoiceTextEntryValue], is experiencing a major water security issue. The town, $[Q5/ChoiceTextEntryValue], is the only community experiencing water insecurity to this degree in Australia. Your town, $[Q5/ChoiceTextEntryValue], has not experienced substantial rain in over 4 years. It is predicted that the community in $[Q5/ChoiceTextEntryValue], will remain on water restrictions for a substantial period. These local laws mean you are not allowed to wash your car or water your yard. Water usage of all residents is monitored and will be monitored for several years by the local Council. It will soon be required by the local Government that all residents will need to invest in water-saving showers heads and sprinklers.

Q21
Imagine that water restrictions are now enforced in your local community. Monetary penalties apply for non-compliance. These restrictions limit lawn watering to only twice per week.

- O You only water your lawn twice per week because of the penalties enforced (1)
- O You water your lawn twice per week because you understand the community benefit of doing so (2)

Q22
You need a new shower head. The sales assistant at your local bathroom store has recommended a particular water saving shower head.

- O You buy the water efficient appliance because it was the one recommended (1)
- O You buy the water efficient appliance because you want to decrease your household water consumption to help with the community's water supply issue (2)

Q23
Washing driveways with a hose is not currently allowed under the new water restrictions. You see your neighbour washing their driveway with a hose.

- O You go over and talk to your neighbour about the water restrictions and pass on what you know about water saving techniques (1)
- O You go over and remind your neighbour that they are not meant to wash their driveway with a hose (2)

Q24
The local council has provided each household with a shower timer as a water saving initiative.

- O You put the shower timer in your bathroom to see how long your usual showers take (1)
- O You set the timer so you take shorter showers to conserve water (2)

Q25
Under the new water restrictions, you are only allowed to use water saving hose fittings.

- O You install water saving hose fittings because this is all you are allowed now (1)
- O You replace your hose fittings to the water saving fittings to decrease your household water consumption (2)

Q26
The sales assistant at your local nursery has recommended you buy particular plants that are ideal for dry climates.

- O You buy drought resistant plants to make your garden more water efficient (1)
- O You buy the plants because the assistant has recommended them (2)

These are the behaviours you chose from the last set of questions:
$[Q21/ChoiceGroup/SelectedChoices]
$[Q22/ChoiceGroup/SelectedChoices]
$[Q23/ChoiceGroup/SelectedChoices]
$[Q24/ChoiceGroup/SelectedChoices]
$[Q25/ChoiceGroup/SelectedChoices]
$[Q26/ChoiceGroup/SelectedChoices]

Q27 How likely do you think you would actually engage in the behaviours you chose above, to assist with a water security issue in your city/town/community?

- Extremely likely (1)
- Likely (2)
- Somewhat likely (3)
- Neither likely nor unlikely (4)
- Somewhat unlikely (5)
- Unlikely (6)
- Extremely unlikely (7)

Q28 How likely do you think your engagement in these behaviours would minimise the impact of water insecurity in your city/town/community?

- Extremely likely (1)
- Likely (2)
- Somewhat likely (3)
- Neither likely nor unlikely (4)
- Somewhat unlikely (5)
- Unlikely (6)
- Extremely unlikely (7)

End of Block: Section 3a: Scenario 1

Start of Block: Section 3b: Scenario 2

Section 3b

Please read the following scenario and imagine that you are currently experiencing the situation described. Keep in mind that each scenario you are presented will be different, so please read carefully. The questions immediately after this scenario pertain to only this scenario.

Scenario 2

Currently Australia is experiencing a water security issue. Australia is not the only country experiencing water insecurity in the world, however it should still be of concern to the Australian population. Australia, overall, has not experienced substantial rain in over 12 months. It is predicted that Australia will experience many negative effects as a result of this water security issue. This will include mass soil erosion, a decrease in pond/dam levels and a shortage in stock production.

Q29 Please indicate how much you think the negative impacts (mass soil erosion, decrease in pond/dam levels and shortage in stock production) are likely to effect the options below.

On the scale below, 1 represents "Not likely at all to be effected" and 7 represents "Extremely likely to be effected".

	1 (Not likely) (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (Extremely likely) (7)
You personally (1)	O	O	O	O	O	O	O
Your friends and family (2)	O	O	O	O	O	O	O
People in your current city/town (3)	O	O	O	O	O	O	O
Your current city/town (i.e. economically/environmentally etc.) (4)	O	O	O	O	O	O	O
People nationally within Australia (5)	O	O	O	O	O	O	O
Australia (i.e. economically/environmentally etc.) (6)	O	O	O	O	O	O	O

Q30 If this was a real life scenario, please indicate how much you think the negative effects described in the scenario (mass soil erosion, decrease in pond/dam levels and shortage in stock production) would **negatively** effect the following:

On the scale below, 1 represents "The negative impacts do not negatively effect this option at all" and 7 represents "The negative impacts have extreme negative effects for this option".

	1 (No negative effect) (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (Extreme negative effect) (7)
You personally (1)	O	O	O	O	O	O	O
Your friends and family (2)	O	O	O	O	O	O	O
People in your current city/town (3)	O	O	O	O	O	O	O
Your current city/town (i.e. economically/environmentally etc.) (4)	O	O	O	O	O	O	O
People nationally within Australia (5)	O	O	O	O	O	O	O
Australia (i.e. economically/environmentally etc.) (6)	O	O	O	O	O	O	O

Q31 Please indicate the level of threat each option below would experience as a result of the negative effects of this water security issue:

On the scale below, 1 represents "Extremely threatened and 7 represents "Not threatened at all".

	1 (Extremely threatened) (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (Not threatened at all) (7)
Your personal finances (1)	o	o	o	o	o	o	o
Your right to water (2)	o	o	o	o	o	o	o
Your community's resource (water) (3)	o	o	o	o	o	o	o
The country's natural resource (water) (4)	o	o	o	o	o	o	o
Your health (5)	o	o	o	o	o	o	o
The aesthetics of your property (6)	o	o	o	o	o	o	o
The aesthetics of your community (7)	o	o	o	o	o	o	o
Personal hygiene (8)	o	o	o	o	o	o	o
Ability to partake in recreational activities (accessing pools, water parks, etc.) (9)	o	o	o	o	o	o	o

Q32
Rank which statements you think were most influential/important to you for making decisions about the questions you answered previously about the scenario.
1 being the most influential/important and 4 being the least influential/important.

Click and move questions to indicate rank.

______ Currently Australia is experiencing a major water security issue (1)
______ Australia is not the only country experiencing water insecurity in the world (2)
______ Australia, overall, has not experienced substantial rain in over 12 months (3)
______ It is predicted that Australia will experience many negative effects as a result of this water security issue (for example, mass soil erosion) (4)

Research states that the characteristics of a situation play a large role in the decisions we make about how to act in a particular situation. Research suggests that at any given point we either think about HOW we can do a behaviour or we may choose to go further and think about WHY the behaviour is important. Each option may be more or less appropriate at any one time.

To remind you of the scenario we are talking about, it is represented below. It is followed by questions which give you two options. One reflects the HOW TO line of thinking. The other the WHY AM I DOING THIS line of thought. Out of the two options for each question below, indicate which statement you think best reflects your behaviour if you were faced with these situations.

SCENARIO: Currently Australia is experiencing a water security issue. Australia is not the only country experiencing water insecurity in the world, however it should still be of concern to the Australian population. Australia, overall, has not experienced substantial rain in over 12 months. It is predicted that Australia will experience many negative effects as a result of this water security issue. This will include mass soil erosion, a decrease in pond/dam levels and a shortage in stock production.

Q33
The Government has stated that the majority of the country's water supply is used to water lawns. It is recommended households only water their lawn 3 times per week. In the next couple of years you may not be able to water your lawn at all.

- You try to only water your lawn 3 times per week because that's what's recommended (1)
- You only water your lawn 3 times per week because you understand the future benefit it has on the country's water supply (2)

Q34
You need a new shower head. The sales assistant at your local bathroom store has recommended a particular water saving shower head.

- You buy the water efficient appliance because it was the one recommended (1)
- You buy the water efficient appliance because you want to decrease your household water consumption to help with Australia's water supply issue (2)

Q35
A pamphlet in the mail came from state Government to tell residents that certain activities, such as washing driveways with a hose, wastes water. You see your neighbour washing their driveway with a hose.

- You go over and talk to your neighbour about wasting water and pass on what you know about water saving techniques (1)
- You go over and remind your neighbour that washing driveways with a hose wastes water (2)

Q36
You view a news report stating the positive effects to the countries water consumption by taking shorter showers everyday. The news report recommends only showering for 4 minutes.

- You time your shower to see how long your usual showers take (1)
- You set a timer to 4 minutes so you take shorter showers to conserve water (2)

Q37
Your hose fittings are needing to be replaced. The only hose fittings now available at local hardware stores are those that are water saving.

- You replace your old fittings with water saving hose fittings because this is all that are available (1)
- You replace the old hose fittings and install the water saving hose fittings to decrease your household water consumption (2)

Q38
The sales assistant at your local nursery has recommended you buy particular plants that are ideal for dry climates.

- You buy drought resistant plants to make your garden more water efficient (1)
- You buy the recommended plants because the assistant has recommended them (2)

These are the behaviours you chose from the last set of questions:
$[Q33/ChoiceGroup/SelectedChoices]
$[Q34/ChoiceGroup/SelectedChoices]
$[Q35/ChoiceGroup/SelectedChoices]
$[Q36/ChoiceGroup/SelectedChoices]
$[Q37/ChoiceGroup/SelectedChoices]
$[Q38/ChoiceGroup/SelectedChoices]

Q39 How likely do you think you would be to engage in the behaviours you chose above, to assist with a water security issue in Australia?

- Extremely likely (1)
- Likely (2)
- Somewhat likely (3)
- Neither likely nor unlikely (4)
- Somewhat unlikely (5)
- Unlikely (6)
- Extremely unlikely (7)

Q40 How likely do you think your engagement in these behaviours would minimise the impact of water insecurity in Australia?

- Extremely likely (1)
- Likely (2)
- Somewhat likely (3)
- Neither likely nor unlikely (4)
- Somewhat unlikely (5)
- Unlikely (6)
- Extremely unlikely (7)

End of Block: Section 3b: Scenario 2

Start of Block: Block 3

Q41 Do you have any further comments regarding the water security issue within Australia?

____
____
____

Q42
Thank you for participating in my study!
If you have any questions about the study, please contact Madelyn Pardon or Dr Anne Swinbourne.

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11.10 Appendix J

11.10.1 Study 2 Ethics Approval

This administrative form
has been removed

11.11 Appendix K

11.11.1 Study 2 Information Sheet

JAMES COOK UNIVERSITY
AUSTRALIA

INFORMATION SHEET

PROJECT TITLE: **Out of sight, out of mind? Investigating how people think about water.**

My name is Madelyn Pardon and I am a postgraduate research student at James Cook University. I would like to invite you to take part in my research project investigating the drivers of water security behaviour. In this research, I am interested in understanding how a person's perceptions and decisions differ when exposed to varying levels of drought severity.

This study is also being conducted by Dr Anne Swinbourne and Dr Connar McShane and will contribute to my Thesis for my Doctorate of Philosophy (Research) at James Cook University.

If you would like to participate in this study, you will be invited to read two hypothetical scenarios and fill out a questionnaire. With your consent, the questionnaire will enquire about your concerns regarding water availability, what information you find most useful when making decisions about your water use and water usage behaviour. The questionnaire should only take approximately 20 minutes of your time to complete.

Taking part in the study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. By completing the questionnaire, you are consenting to participate in the study.

The data from the study will be used in research publications and reports as part of my postgraduate research. Your responses will be completely unidentifiable in these reports and publications. At no stage do we ask for any identifying information from you.

Thank you for your interest in completing this questionnaire and contributing to my research project. Your time is greatly appreciated. If you know anyone else that would be interested in participating could you please pass on this information sheet to them?

Below is the link to the questionnaire.

https://jcuchs.qualtrics.com/jfe/form/SV_9HoW0MmnmhEyzEV

If you have any questions about the study, please contact **Madelyn Pardon** or **Anne Swinbourne.**

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If you have any concerns regarding the ethical conduct of the study, please contact:
Human Ethics, Research Office
James Cook University, Townsville, Qld, 4811Phone: (07) 4781 5011 (ethics@jcu.edu.au)