CRC for
Water Sensitive Cities

Getting the message right:

The use of frames, community-friendly terminology and visuals

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Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

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Engaging Communities with Water Sensitive Cities – A2.3 – July – 2017

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Publisher

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Date of publication: October 2017

An appropriate citation for this document is:

Schultz, T., Dean, A., Newton, F., Ross, H., and Fielding, K. (2017). Getting the message right: the use of frames, community-friendly terminology and visuals. Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities

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Brief summary and recommendations

An important aspect of effectively engaging communities in a water sensitive future is to communicate messages using easy to understand terminology, appealing visuals and suitable message framing. The findings from Project A2.3 indicate that messages need to be tailored to effectively engage different audiences, as messages intended for "everyone" are unlikely to appeal to everyone. The following guidelines have been developed on the use of visuals, framing, and terminology that appeal to different target audiences.

Using a sustainability message frame can increase support for water sensitive cities among the 'disengaged'

When initiating communication, an organisation may choose to emphasize a particular aspect of the message that they hope will resonate with the target audience. For example, water sensitive cities could be viewed as an initiative that promotes environmental *sustainability* or one that allows cities to become more *livable*. These different perspectives can be referred to as 'frames'. An experimental study testing different message frames showed that the effectiveness of a message frame depended on the audience. The study found that:

- ✓ All message frames are equally successful for individuals who are highly engaged with environmental issues.
- ✓ The ***sustainability*** **frame was more influential** in garnering policy support for water sensitive cities than any other message frames among individuals who do not care strongly about environmental issues.
- ✓ Using a ***productive*** **message frame did not generate increased support for water sensitive cities. I**n people with a strong environmental identity, a productive frame reduced support.

Jargon can create a barrier to seeking and understanding information

A key part of "getting the message right" is ensuring that the language used allows the reader to understand the content of the message. Our report on "Community understanding of water terminology" identified that there are many water-related terms not understood by community members, for example, "water sensitive", "biofiltration" and "catchments". An experimental study on the use of water-related jargon versus community-friendly terminology found that:

- ✓ **Information presented using community-friendly terminology led to higher levels of engagement with the message** and community members feeling more positive and having greater trust in the presented information.
- ✓ For community members that care strongly about environmental issues, **the use of community-friendly terminology increased their willingness to share the information** they had read with others.

Jargon	Community-generated alternative
Bio-filtration	Natural pollutant removal
Decentralised water supply	Neighbourhood water supply
Urban Heat Island Effect	Inner city warming
Water sensitive city	Water-wise city

Appealing images elicit a strong positive emotional connection, are understood as relevant to stormwater management, and are perceived as being personally relevant.

Images can be an effective mechanism for engaging community members with unfamiliar or complex concepts like the transition to water sensitive cities. The findings from empirical studies on the use of images suggest:

- ✓ When using images of green infrastructure, like raingardens and greenwalls, **choose images that have flowers or vibrant green foliage** as these will likely elicit more positive emotions and greater engagement among message recipients.
- ✓ **Use local images** as much as possible as they are more engaging.

Avoid images that elicit disgust

(Source: Melbourne Water)

Use local images that include people

(Source: Healthy Land and Water)

- ✓ As community understanding of water catchments is poor, **explain the relevance of images of creeks, rivers, and oceans** to the topic of stormwater management.
- ✓ **Message recipients are engaged by images of people;** depicting people using green infrastructure is therefore a meaningful way to engage people with the topic of water sensitive cities.
- ✓ **Images of flood clean-up events can be highly engaging,** they elicit positive emotions, are seen as relevant to stormwater and are also seen as personally relevant—at least for those who live in regions that experience floods. Therefore consider using these types of images if you want to communicate about flooding.
- ✓ **Avoid the use of images that elicit disgust,** like stormwater drains and degraded waterways, as this has negative consequences for message engagement and policy support among individuals that are disengaged with water issues

Executive Summary

Background and rationale

Community engagement is increasingly encouraged as a method to improve project outcomes, build trust in organisations, and increase support for the transition to water sensitive cities. This report aims to highlight the degree to which different communication techniques can achieve these and other outcomes. The research was conducted as part of the A2.3 project: *Engaging communities with water sensitive cities.* It aimed to assess whether the frames, terminology, and visual aspects of communication can influence how community members process and engage with messages relevant to the creation of water sensitive cities. Specifically, the report will discuss the results of four studies:

- An experimental study that examined how different social sub-groups respond to different types of message frames about water sensitive cities (Study 1),
- An experimental study that assessed the effect of using jargon or community friendly terminology and images on message engagement (Study 2),
- A study that assessed the engagement potential of images commonly used in communications about water sensitive urban design (Study 3); and
- An experimental study that assessed the effect of images that elicit disgust - an emotion commonly elicited by water-related imagery - on message engagement (Study 4).

The findings from these studies will collectively inform and support the development of strategies that will allow researchers, experts, and practitioners to “get the message right”. That is, to effectively communicate messages that will assist communities in the transition to water sensitive cities. The results will also inform the development of an online database of effective and community-friendly terminology and visuals for use in community engagement activities.

Study 1: Message Framing

What was done?

An experimental survey was conducted to assess whether promoting certain benefits of water sensitive cities influenced community support for the transition to water sensitive cities. A sample of adults (N = 790) were randomly allocated to read one of five different message ‘frames’ about water sensitive cities, each highlighting different benefits:

- Frame 1: Liveability
- Frame 2: Sustainability
- Frame 3: Resilience
- Frame 4: Economic productivity
- Frame 5: Control

Following the information, participants completed survey measures that rated their support for water sensitive cities.

What was found?

The study showed that the use of different message frames influences community support for the transition to water sensitive cities. Specifically, the study found that:

- Individuals with high levels of certain values (e.g. care strongly for the environment) or who have greater levels of engagement with water are less influenced by different types of framing. This is may be because they have well-informed (positive) attitudes that are not easily influenced.

- The message framing was most influential for participants disengaged from water-related issues.
- The sustainability framing of messages was more influential in garnering policy support for water sensitive cities than the other message frames, among individuals who were more disengaged with water-related issues.
- The economic message frames did not generate increased support for water sensitive cities; among people with strong environmental identity this framing reduced support.

Study 2: Terminology

What was done?

An experiment was conducted to test whether the use of jargon, in comparison to community-friendly terminology and visuals, influences engagement with messages about sustainable urban stormwater management. A sample of community members (N = 300) were randomly allocated to read one of four different versions of a communication message where the content was held constant but the terminology used varied. The four versions were as follows:

- A **jargon** message
- A **community-friendly terminology** message
- A **community-friendly plus images** message
- A **control** message

After reading one of the messages participants completed a questionnaire designed to assess their level of engagement with the message content.

What was found?

The study showed that when people were presented with a factsheet about urban stormwater management that used **community-friendly terminology**, as compared to a factsheet that used jargon or when they were not presented with a factsheet (control condition), they were more likely to:

- engage with the message
- report more understanding of the terminology used
- express more positive 'affect' (i.e., feelings) and less negative affect (feelings)
- have greater trust in the information

In terms of willingness to share information about stormwater management and to support water sensitive urban design (WSUD) policy initiatives that would lead to increases in council rates, the effects of message language depended on the strength of the participants' environmental identity. That is, for participants with a strong environmental identity, exposure to community-friendly terminology (relative to jargon) increased their support for WSUD policy initiatives and their willingness to share information about stormwater management with others.

Study 3: Image Q-sort

What was done?

This study empirically tested how images influence individuals' engagement with water sensitive urban design (WSUD). Prior research suggests that engagement can occur when an image:

- evokes or elicits a positive *emotional connection*
- is perceived to have *personal relevance*
- is perceived as *relevant to the topic* being communicated

Using an image sorting technique called Q-method, a sample of residents from Brisbane, Queensland were asked to rank a selection of images commonly used in communications about urban stormwater management, according to how well the image aligned with each of the three dimensions listed above.

What was found?

A summary of how different image categories were ranked for each dimension can be seen in Table 1. With regard to an **emotional connection**, participant responses were highly consistent. Images of the receiving bodies of stormwater (i.e., pictures of pristine creeks, rivers, and oceans) were ranked the highest in terms of emotional connection, eliciting emotions like joy and love. Images of people engaged in recreation activities (e.g., an image of a bike-rider along the Brisbane River) were also consistently ranked highly in terms of positive emotion. Images of stormwater infrastructure were among those that ranked the lowest with regard to emotion, with participants indicating that these images often elicited feelings of disgust or anger. An image of a plastic bag floating near a coral reef received the lowest possible score for the emotion dimension, with participants indicating the image elicited sadness.

With respect to **topic relevance**, participant responses to the images were somewhat consistent. Unsurprisingly, images of stormwater infrastructure dominated the top of the scale for this dimension. For a small minority of the participants, images of ocean environments were also ranked very highly in terms of topic relevance. However, the majority of participants ranked these same images as having very low topic-relevance and failed to identity the impact of stormwater pollution on ocean health. Furthermore, participants failed to identify the important role of new stormwater infrastructure, in that related images (e.g., raingardens and green walls) were ranked as only 'somewhat' topic-relevant.

In terms of **personal relevance**, the responses from participants were highly varied, with five participant clusters emerging (i.e., sub-groups of participants that reacted similarly to the images). Despite this variation, images of people engaged in flood clean-up activities were considered high in personal relevance by all participants. Whilst pictures of ocean environments (both pristine and polluted) were ranked as highly personally relevant for the largest proportion of participants, these images were ranked as either "somewhat" or "least" personally relevant by the remaining participants. Similarly, around half of the participants ranked images of people engaged in recreation activities and cityscapes as highly personally relevant. Images of least personal relevance were those of traditional stormwater infrastructure.

Table 1: Summary of the extent to which images engaged participants in terms of emotion, topic relevance, and personal relevance (N = 23)

Image Category	Emotion	Topic Relevance	Personal Relevance
WSUD	Neutral	Moderate	Moderate
Stormwater infrastructure	Negative	High	Low
Rainwater tanks	Neutral	Moderate	Moderate
Swales/bio-filtration basins	Neutral	Moderate	Moderate
Pristine, inland bodies of water in rural settings	Positive	Low	Moderate
Pristine ocean environments	Positive	Mixed response	Mixed response
Ocean environments with plastic	Low	Moderate to High	Mixed response
Flood events	Low	Moderate to High	Moderate
Flood clean-up activities	Neutral to Positive	Moderate	High
People engaged in recreational activities	High	Low	Moderate to High
Cityscapes	Neutral to Positive	Moderate	Moderate to High

Study 4: Images that elicit disgust

What was done?

A common emotion elicited by images used in stormwater management communications is disgust. Such images include those of polluted stormwater and degraded waterways. Therefore, two studies (N = 235 and N = 288) were conducted to assess the effect of disgusting images on how community members process, and engage with, messages about stormwater management. Across both studies participants were allocated to read information about stormwater management. However, the information, in the form of factsheets, varied in terms of the supporting images used:

- Factsheet with embedded image designed to elicit disgust (Study 1 & Study 2)
- Factsheet with embedded image designed to elicit sadness (Study 2)
- Factsheet with no embedded image (control condition – Study 1 & 2)

After reading the factsheets, participants were asked a number of questions designed to measure various aspects of their engagement with the factsheet content.

What was found?

In both studies participants presented with images that elicit disgust reported less ability to process and pay attention to the message. There was also some evidence to suggest that for people who had less interest in the environment (i.e., low environmental identity) the use of disgusting images lowered:

- their support for WSUD initiatives that would have a large impact on how much they had to pay in terms of council rates (Study 1)
- their willingness to share information with others (Study 2)
- the overall appeal of the factsheet (Study 2)
- the extent to which they were interested in seeking more information about stormwater management (Study 2)

The use of disgusting images in communications about stormwater management had little to no impact on people who strongly identified with environmental causes, with only weak evidence to suggest that the images had a positive impact on their willingness to support WSUD initiatives that could impact on the price of their council rates or their willingness to share information with others.

Implications for practice

Taken together, these findings provide important insights about the terminology, framing, and images that are likely to be most effective at promoting engagement with sustainable urban water management within specific community sub-groups. The report discusses implications for practice of these findings.

Background

The role of communication in engagement

Studies indicate that effective communication techniques, combining easy to understand terminology, engaging visuals and suitable message framing, can build support for new policies. Accordingly, Project A2.3 conducted a series of experiments to establish clear and specific guidelines on the use of visuals, framing, and terminology relevant to the communication of an important water management issue, that of sustainable urban stormwater management.

Definition of engagement

Project A2.3 has adopted a multidimensional model of water engagement that incorporates three distinct, yet inter-related, elements: cognition, emotion and behaviour (Dean, Lindsay, Fielding, & Smith, 2016). Cognitive engagement refers to knowledge about key water-related issues, and the capacity to apply this knowledge. Emotional engagement incorporates positive attitudes about water and water management. Behavioural engagement reflects how involved the individual is in water sensitive behaviours, such as reducing water use, or reducing pollution. Therefore, a water sensitive citizen is someone who is knowledgeable about water, is supportive of water sensitive policy initiatives, and indicates willingness to participate in water sensitive practices. A key aim of the studies outlined in this report is to identify the mechanisms (i.e., the words, images and frames) that can help foster the development of water sensitive citizens.

Why is message framing important?

All issues can be viewed from a variety of perspectives. For example, water sensitive cities could be viewed as an initiative that promotes environmental sustainability, or one that allows our cities to become more livable. These different perspectives can be referred to as ‘frames’. Framing is the process by which people “develop a particular conceptualisation of an issue or reorient their thinking about an issue” (Chong & Druckman, 2007, p. 104).

When initiating communication, we may choose to emphasise a particular aspect of our message that we hope will resonate with our audience. For example, advocates of recycled water schemes in Singapore highlighted the importance of recycled water for national security (Dean, Fielding, Ross, & Newton, 2016). This process of selecting what to emphasise in a message is referred to as ‘message framing’.

It is expected that different types of people will respond differently to different message frames. For example, individuals most likely to be engaged with water-related issues include those with gardens and experience of water restrictions, regular users of water-ways, with strong social norms about water saving (Dean, Lindsay, et al., 2016). Individuals at risk of being disengaged include those who do not use waterways regularly, those with weak social norms, and those who do not see themselves as being ‘environmental’. Building support for water sensitive cities will require communicating effectively with both of these groups; yet, it is possible that these groups might be persuaded by different types of messages. Study 1 described in this report examines how different social subgroups respond to different types of messages about water sensitive cities.

Why is terminology important?

A key part of “getting the message right” is ensuring that the terminology and language used allows the reader to engage with, and understand, the content of the message. Using jargon can disengage people and decrease their motivation to pay attention to the message. This phenomena can be explained by a concept from social psychology known as ‘fluency’. Fluency refers to the “subjective experience of ease or difficulty associated with completing a mental task” (Oppenheimer, 2008, p. 237). Fluency research has shown that when statements are perceived to be more fluent (that is, people have a sense of ease in reading and understanding them) they are also judged as more true, likeable, frequent, and to come from more intelligent sources (Oppenheimer, 2008). Fluency can impact on whether people attend to information, remember it; it can also direct their choices. Therefore, terminology that people feel is easy to understand is more likely to engage them with a topic.

In September 2015, Project A2.3 conducted a survey of 415 residents of Brisbane, Sydney, Melbourne, and Perth to assess their understanding of a range of water-related terms commonly used by the water industry. The study found that there were many water-related terms commonly used in the water industry that were not understood by community members (Dean, Fielding, & Newton, 2016). The findings from that study were used to inform the development the experimental study discussed in this report. The experimental study was designed to assess the impact of using jargon, in comparison to community-friendly terminology and images, on a number of key outcomes such as message engagement, trust, willingness to share information, and overall policy support.

Why are visuals important?

Images can be an effective mechanism for engaging people (O'Neill, 2013; Sheppard, 2005; Smith & Joffe, 2013), particularly for communicating unfamiliar or complex concepts (Larson & Edsall, 2010; Trumbo, 1999). Indeed, marketers, politicians, and the media have long understood the significant effect images can have on engagement with a topic (DiFrancesco & Young, 2011; Domke, Perlmutter, & Spratt, 2002; Lazard & Atkinson, 2015). Accordingly, there is growing interest in identifying the properties or dimensions of images that engage people with pro-environmental and/or scientific communication (Anderson, 2015). For example, within the climate change communication literature, images depicting positive energy futures (e.g., houses with solar panels and wind turbines), have been associated with enhanced feelings of self-efficacy to address climate change (O'Neill & Nicholson-Cole, 2009). The three image studies described in this report sought to expand on this new area of research by examining how images can influence individuals' engagement with water sensitive urban design.

The purpose of the image Q-sort study was to identify how images, commonly used in communications about storm water management, varied in salience along three dimensions: personal relevance, emotion, and perceived topic-relevance. The three dimensions were identified from an earlier literature review as important for engagement (Kidwell, Farmer, & Hardesty, 2013; Petty & Cacioppo, 1986; Sleenhoff, Cuppen, & Osseweijer, 2015). One of the outcomes of this study was the finding that images of stormwater pollution and degraded waterways commonly elicit the emotion of disgust. Therefore, the aim of the two experimental image studies was to establish, under controlled conditions, the causal effect of the discrete emotion of disgust, as elicited by images, on engagement with a communication message about water sensitive urban design initiatives.

Study 1: Message Framing

Who was surveyed?

A survey of community members residing in Brisbane, Sydney, Melbourne, Adelaide and Perth was conducted in December 2016. A total of 790 adults were recruited from a permission based social research panel with approximately the same number of participants in each of the cities. Participants received a small amount of compensation for taking part. As Table 2 shows, there was a broad age range and the gender breakdown was relatively even. There was a high proportion of participants who had undertaken university education when compared to the other two education categories (i.e., school or trade/diploma) but there was a relatively even spread across income brackets.

Table 2: Summary of participant characteristics

Demographic	Total Sample N = 790	
Age	Mean Range	46.6 years 18-88 years
Gender	Males Females	393 (49.9%) 395 (50.1%)
City	Sydney Melbourne Brisbane Perth Adelaide	211 (26.7%) 228 (28.9%) 114 (14.4%) 137 (17.3%) 100 (12.7%)
LOTE*	Yes No	187 (23.7%) 601 (76.1%)
Education	School Trade/Diploma University Other	28.0% 18.4% 40.7% 12.9%
Income**	Less than $50,000 $50,001 to $100,000 $100,001 to $150,000 $150,001 to $200,000 More than $200,000 Prefer not to say	226 (28.6%) 246 (31.1%) 122 (15.4%) 45 (5.7%) 24 (3.0%) 114 (14.4%)

*Language other than English spoken at home
**Total annual household income before tax

What was tested?

An experiment was conducted to assess whether promoting certain benefits of water sensitive cities (WSC) influenced community support for the transition to water sensitive cities. Participants were randomised to one of five different groups. Each group received the same information about water sensitive cities but this information was framed differently, highlighting different benefits (Figure 1):

- Frame 1: Liveability
- Frame 2: Sustainability
- Frame 3: Resilience
- Frame 4: Economic productivity
- Frame 5: Control (brief description only)

After reading this information, participants then rated their support for water sensitive cities. Analysis examined whether certain messages generated greater support than other messages (i) in the group as a whole, and (ii) in different participant subgroups known to be important for water-related engagement. All analysis controlled for differences in age, sex, income, and region.

Figure 1: Different 'message frames' highlighting different benefits of water sensitive cities

What was measured?

Participants answered a number of basic demographic and individual difference questions such as their environmental identity (i.e., how much they see themselves as an environmentally-friendly person) and how often they use their local waterways. After reading the information, participants were asked about their willingness to support their city becoming a water sensitive city. An explanation of how each of these variables was measured is provided in Table 3.

Table 3: Summary of questionnaire content

Variable Name	Question Items	Response Options	Scale Reliability Score[a]
Willingness to support WSC	How likely is it that you would support your city becoming a water sensitive city, if it had: • no impact on your utility bills, rates or rent • a small impact on your utility bills, rates or rent (up to $100 p/year) • a larger impact on your utility bills, rates or rent (up to $200 p/year)	1 = very unlikely to 6 = very likely	.73
Environmental Identity	Please rate your response to the following statements: • Being environmentally-friendly is an important part of who I am • I am the type of person who is environmentally-friendly • I see myself as an environmentally-friendly person	1 = strongly disagree to 7 = strongly agree	.95
Amenity Use	• How often do you use your local waterways (creeks, rivers, beaches in your region) for social or recreational purposes • How often do you use your local parks and bushland (fields, parks, reserves, public gardens and playgrounds) for social or recreational purposes	1 = never to 5 = very often.	.66
Social norms	People in my community…	1 = never save water around the house and garden to 5 = always save water around the house and garden	Single-item response

[a]Scale reliability is a measure of how closely related a set of question items are. A minimum score for scale construction is .60

What was found?

Overall effects of message frame

In the group as a whole, there were no significant differences between any of the messages on support for water sensitive cities (Figure 2). The sustainability message and the resilience message appear to generate slightly more support, but the actual differences are small, and not statistically significant (F = 1.12; p = 0.34).

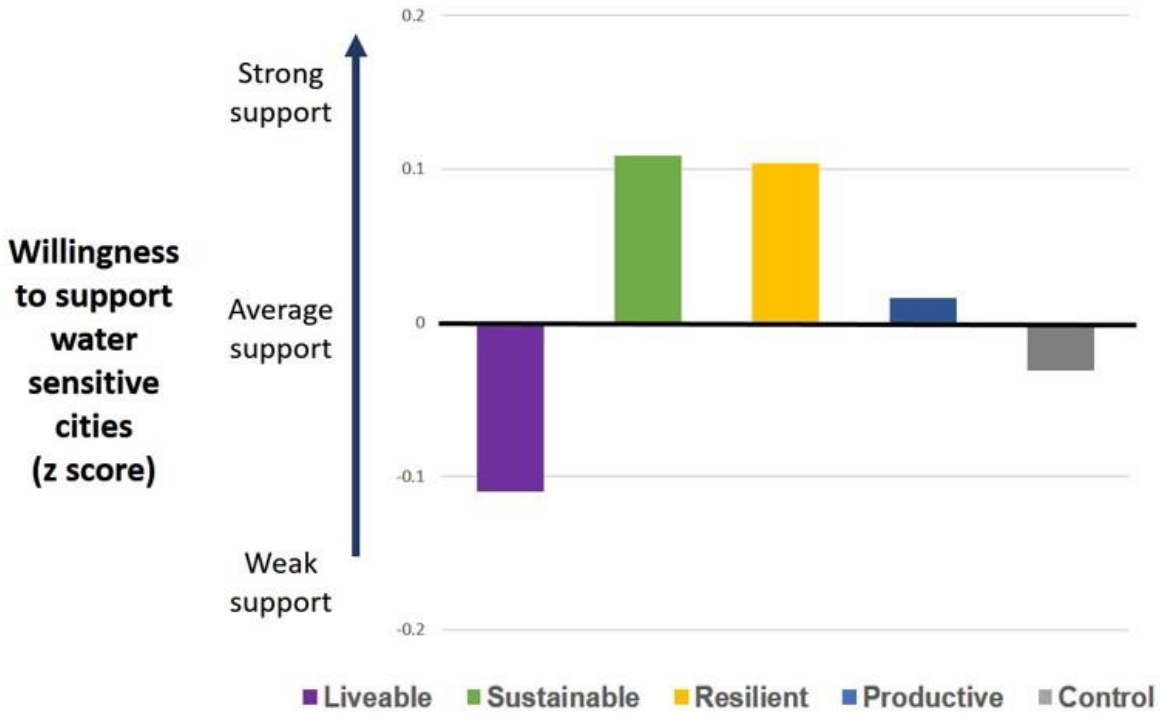


Figure 2: Willingness to support WSC as a function of message frame.

Influence of geographic region

An analysis was also undertaken to examine whether the effectiveness of messages varied across regions. Results show that geographic region did not influence effectiveness of messages ($F = 0.71$; $p = .78$; Figure 3). Some regional variation in support for water sensitive cities can be seen in Figure 3, with Perth exhibiting the greatest support and Brisbane exhibiting the lowest. However, these differences are small and not statistically significant ($F = 1.62$; $p = .17$).

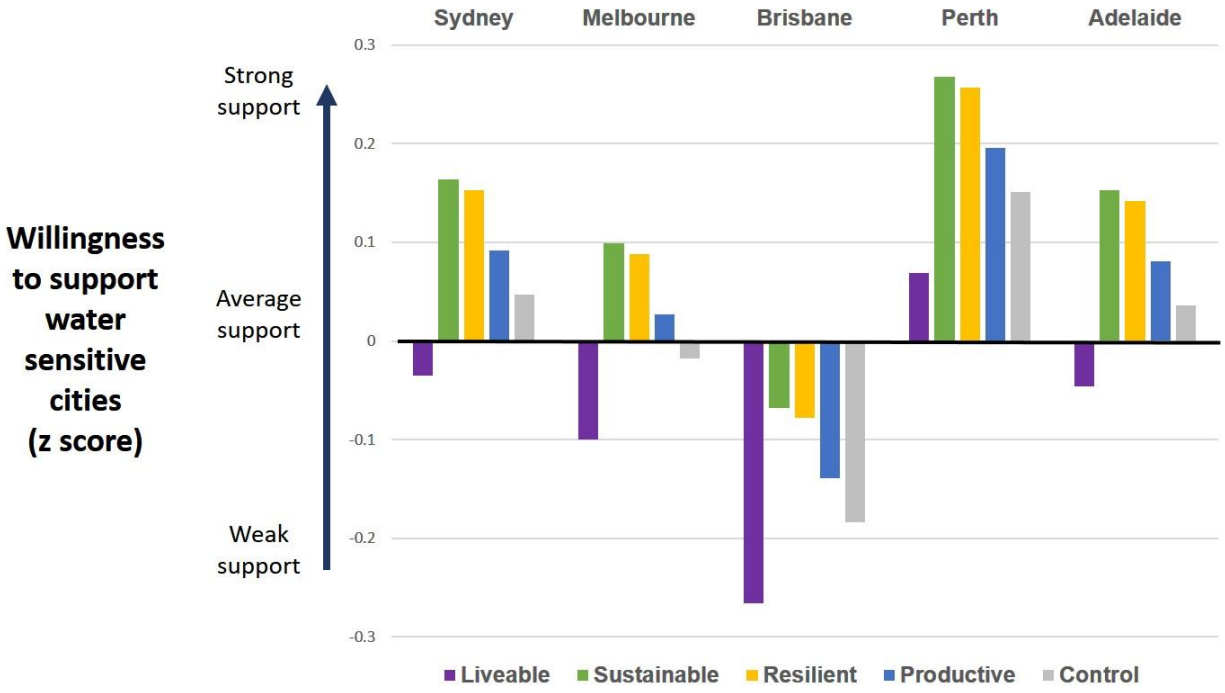


Figure 3: Willingness to support WSC as a function of region.

Influence of environmental identity

Analysis indicated that the effects of message frames were significantly influenced by environmental identity ($F = 2.51$; $p < .05$; Figure 4). Specifically:

- In individuals with low environmental identity, the '*Sustainability'* message was more effective than the control message ($p < .05$). The '*Sustainability'* message was also more effective than the '*Liveability'* message ($p < .01$) and the '*Resilience*' message ($p < .01$).
- For individuals with an environmental identity in the mid-range, the '*Resilience*' message was more effective than the control message ($p < .05$).
- Among individuals with a high environmental identity, the '*Productivity'* message led to *reduced* support for water sensitive cities ($p < .05$).

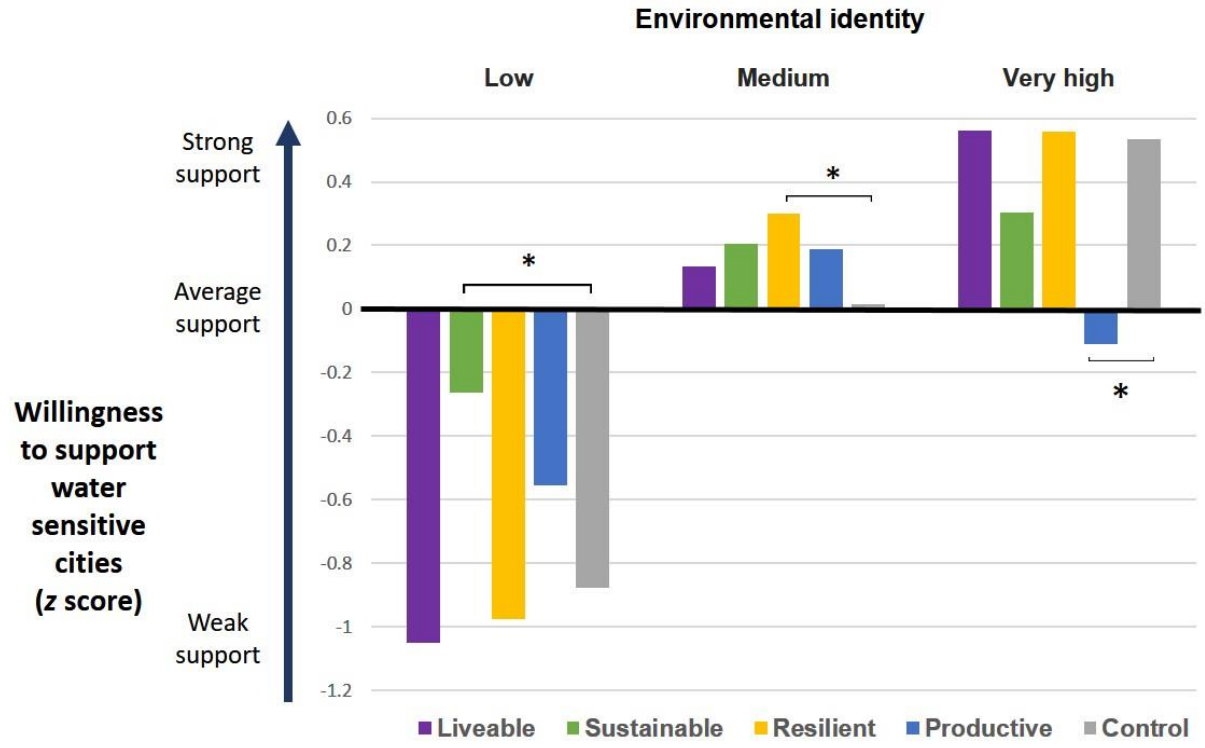


Figure 4: Willingness to support WSC as a function of environmental identity. NOTE: Asterisk denotes significant differences (p<.05).

Influence of social norms

Analysis indicated that the effects of message were significantly influenced by social norms ($F = 2.23$; $p < .05$; Figure 5). Specifically:

- In individuals with low social norms, the '*Sustainability'* message was more effective than the '*Liveability'* message ($p < .05$), although not significantly different to the control condition ($p = .85$).
- For individuals with social norms in the mid-range, both the '*Sustainability'* message and the '*Resilience*' message were more effective than the control ($p < .05$ for each).
- In individuals with high social norms, there were no significant differences between any of the message types.

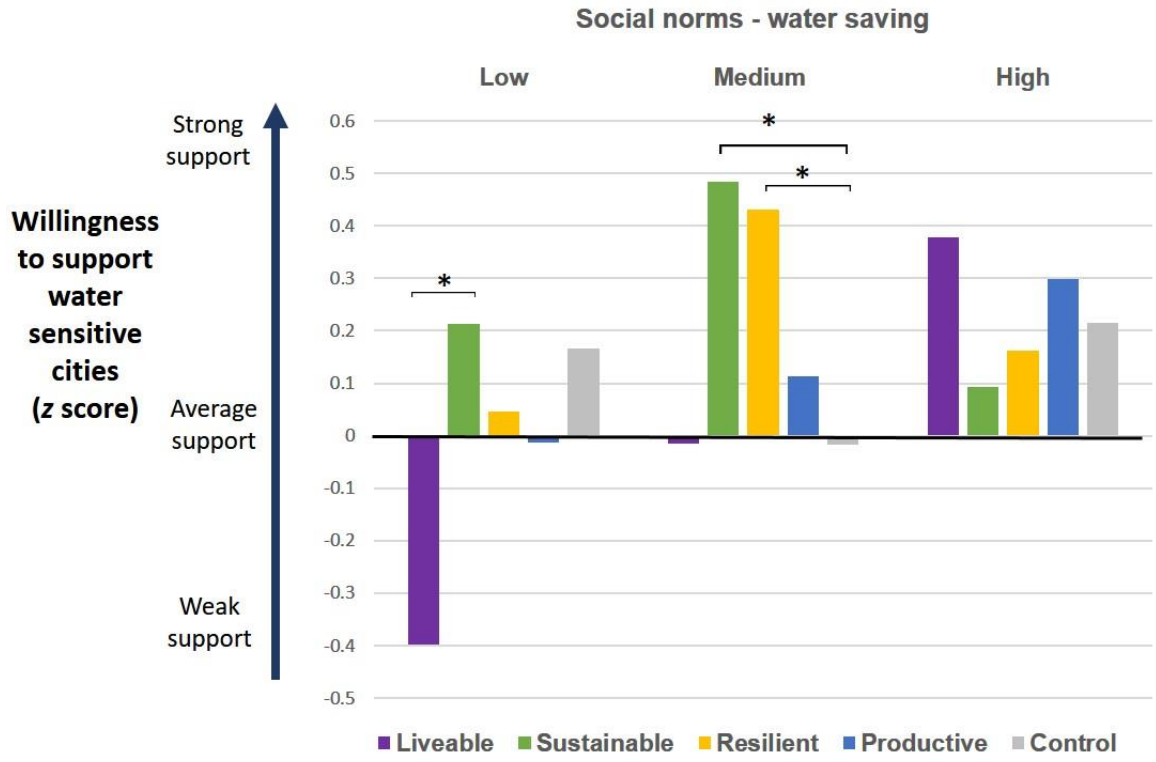


Figure 5: Willingness to support WSC as a function of social norms. NOTE: Asterisk denotes significant differences (p<.05).

Influence of amenity use

Analysis indicated that the effects of message type were significantly influenced by amenity use (F = 2.11; $p < .05$; Figure 6). Specifically:

- Among individuals with low rates of amenity use, the '*Sustainability'* message was more effective than the control message ($p < .05$). The '*Sustainability'* message was also more effective than the '*Liveability'* message ($p < .01$).
- For individuals with rates of amenity use in the mid-range, there were no significant differences between any of the message types.
- In individuals with high rates of amenity use, there were no significant differences between any of the message types.

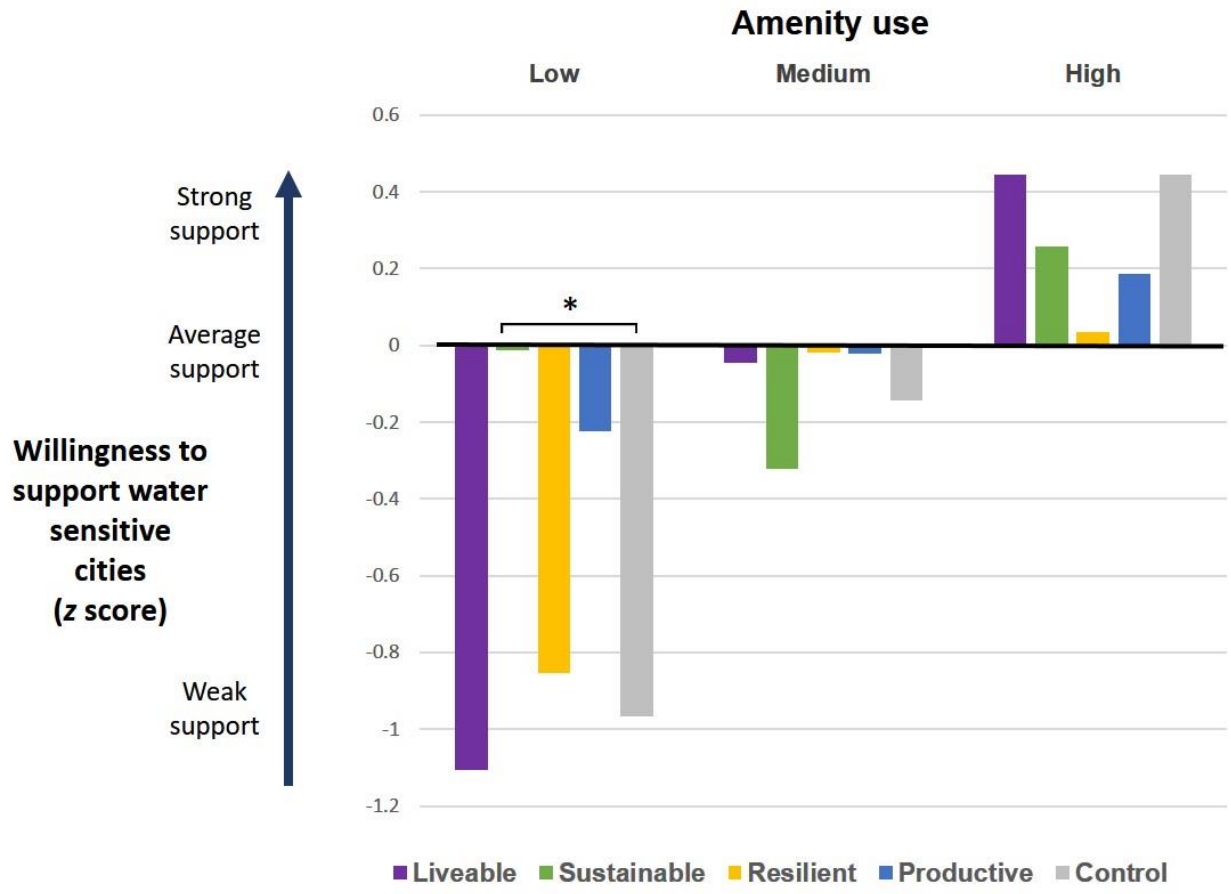


Figure 6: Willingness to support WSC as a function of amenity use. NOTE: Asterisk denotes significant differences (p<.05).

Study 2: Terminology

Who took part?

A survey of community members in Brisbane, Sydney, Melbourne, and Perth was conducted in June 2016. A total of 300 adults were recruited from a permission based social research panel with approximately the same number of participants in each of the cities. Participants received a small amount of compensation for taking part. As Table 4 shows, there was a broad age range and the gender breakdown was relatively even. In terms of education, a high proportion of participants had undertaken university education when compared to the other two education categories (i.e., school or trade/diploma) but there was a relatively even spread across income brackets.

Table 4: Summary of participant characteristics

Demographic	Total Sample N = 300	
Age	Mean Range	52 years 18-90 years
Gender	Males Females	139 (46.3%) 161 (53.7%)
City	Brisbane Sydney Melbourne Perth	74 (24.7%) 63 (21.0%) 79 (26.3%) 84 (28.0%)
LOTE*	Yes No	63 (21.0%) 237 (79.0%)
Education	School Trade/Diploma University Other	72 (24.0%) 101 (33.7%) 125 (41.7%) 2 (0.7%)
Income**	Less than $50,000 $50,001 to $100,000 $100,001 to $150,000 $150,001 to $200,000 More than $200,000 Prefer not to say	82 (27.3%) 101 (33.7%) 47 (15.7%) 20 (6.7%) 12 (4.0%) 38 (12.7%)

*Language other than English spoken at home
**Total annual household income before tax

What was tested?

An experiment was conducted to investigate whether the use of community-friendly terminology and visuals improved engagement outcomes compared to the use of jargon or not receiving any information. The focal issue was sustainable urban stormwater management. A sample of community members were randomly allocated to read one of four different versions of a communication message and the effect of each message was assessed in terms of engagement with the message content.

In the ***control*** group (n = 71), participants simply read a brief paragraph stating:

> *Around Australia local governments and water organisations are working together to address the important issue of stormwater pollution. A range of new initiatives are being planned to reduce the amount of pollutants in stormwater and the negative impact of this pollution on local waterways.*

In the three experimental message groups participants read the above statement plus a one-page factsheet about urban stormwater management, which included a definition of stormwater pollution, why it is an important topic and initiatives for improved management. Whilst the type of information included in the factsheet was consistent, how the information was presented varied across each of the three experimental message groups.

In the ***jargon*** message group (n = 79), highly technical terms were used throughout the factsheet (see Table 5 below). In the ***community-friendly*** message group (n = 79), the technical terms were substituted with terms more widely understood by the lay public (see Table 5 below).

Table 5: Jargon vs Community-friendly terminology

Jargon	Community-friendly terminology
urban environments	cities and towns
non-visible pollutants	pollution that we can't see
plant biofiltration systems	raingardens
aquatic and marine ecosystems	rivers and oceans
non-permeable surfaces	concrete

In the final message group, participants read the same information as the community-friendly message group with one exception. In this condition the factsheet included illustrative ***images*** and figures (n = 71). An example image is provided in Figure 7 below.

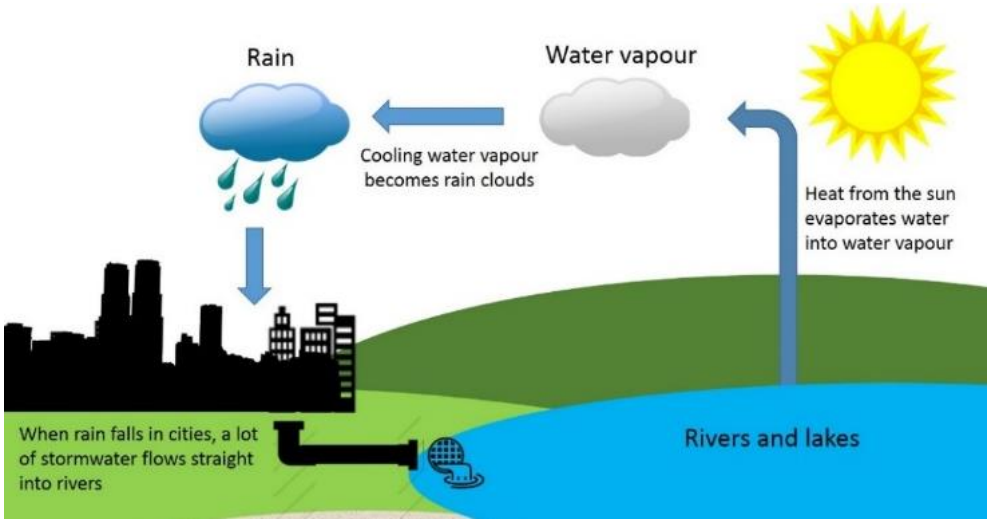


Figure 7: The water cycle

Full versions of the four experimental messages can be seen in Appendix A. After reading the information, participants completed a survey which measured the concepts described below.

What was measured?

Participants answered a number of basic demographic and individual difference questions such as their environmental identity (i.e., how much they see themselves as an environmentally-friendly person) and how often they use their local waterways. After reading the provided information, participants were asked a number of questions designed to measure various aspects of their level of engagement with the message content, including:

- Message engagement
- Terminology comprehension
- Willingness to share information with others
- Positive and negative affect
- Trust
- Willingness to support WSUD policy

An explanation of how each of these variables was measured is provided in Table 6.

Table 6: Summary of questionnaire content

Variable Name	Question Items	Response Options	Scale Reliability Score[a]
Environmental Identity	Please rate your response to the following statements: • Being environmentally-friendly is an important part of who I am • I am the type of person who is environmentally-friendly • I see myself as an environmentally-friendly person	1 = strongly disagree to 7 = strongly agree	.97
Waterway Use	How often do you use your local waterways? • Recreational fishing • Recreational boating including water skiing jet skiing, etc • Picnics and barbeques • Enjoying the scenery, photography, plants, bird watching • Swimming, surfing, going to the beach • Rowing, kayaking, canoeing	1 = never to 5 = very often.	.83
Message engagement	Please rate your response to the following statements: • The information provided was easy to read • The information provided was easy to understand • The information made me stop and think • The information was presented in an interesting way.	1 = strongly disagree to 6 = strong agree	.88
Terminology comprehension	• To what degree did you understand the concepts described in the information provided? • How well do you think you understood the terms used in the information you just read?	1 = not at all to 5 = a lot	.83
Willingness to support WSUD	How likely would you support initiatives to manage stormwater pollution in their area if there was: • no impact on your rates or rent? • a small impact on your rates or rent (less than $50 per year)? • a larger impact on your rates or rent (up to $200 per year)?	1 = very unlikely to 5 = very likely	Single-item response
Willingness to share information	Please rate your response to the following statements: • I would be willing to talk to others about the information provided • I would be willing to talk to others about the type of initiatives outlined • I would be willing to persuade others to support these initiatives	1 = strongly disagree to 6 = strongly agree	.82

Variable Name	Question Items	Response Options	Scale Reliability Score[a]
	• I would be willing to 'like' or 'share' information about these initiatives on Facebook or other social media		
Positive affect	To what degree did you feel the following emotions: • Enthusiastic • Pleased • Interested • Worried	1 = not at all to 5 = a lot	.80
Negative Affect	To what degree did you feel the following emotions: • Bored • Distracted • Confused • Annoyed	1 = not at all to 5 = a lot	.71
Trust	Please rate the degree to which the information: • Cannot be trusted – Can be trusted • Is inaccurate – Is accurate • Is unfair – Is fair • Does not tell the whole story – Tells the whole story • Is biased – Is unbiased	5-point semantic differential scale	.88

[a]Scale reliability is a measure of how closely related a set of question items are. A minimum score for scale construction is .60

What was found?

All data was analysed using the statistical software package SPSS Version 22. The effect of using different types of terminology on each of the constructs was assessed after first controlling for the effects of age, sex and education.

For each variable, the effect of the experimental conditions was further tested to see if it varied depending on a number of individual characteristics such as whether they owned their own home or the size of their garden. However, only participants' level of environmental identity moderated their responses to the use of different types of terminology.

Message engagement

The type of terminology used to convey information about stormwater management influenced the degree to which participants felt engaged by the message contents, $F = 10.65$, $p < .001$ (Figure 8). In comparison to the jargon message group ($M = 4.82$, $SD = 0.77$), the use of community friendly-terminology ($M = 5.20$, $SD = 0.77$) or community-friendly terminology plus images ($M = 5.34$, $SD = 0.73$) led to higher levels of message engagement, p's $< .001$. Further testing showed that there was no difference between the control group ($M = 4.75$, $SD = 0.75$) and jargon message group, $p = .710$. Similarly, there was no difference between the community-friendly and image conditions, $p = .277$.

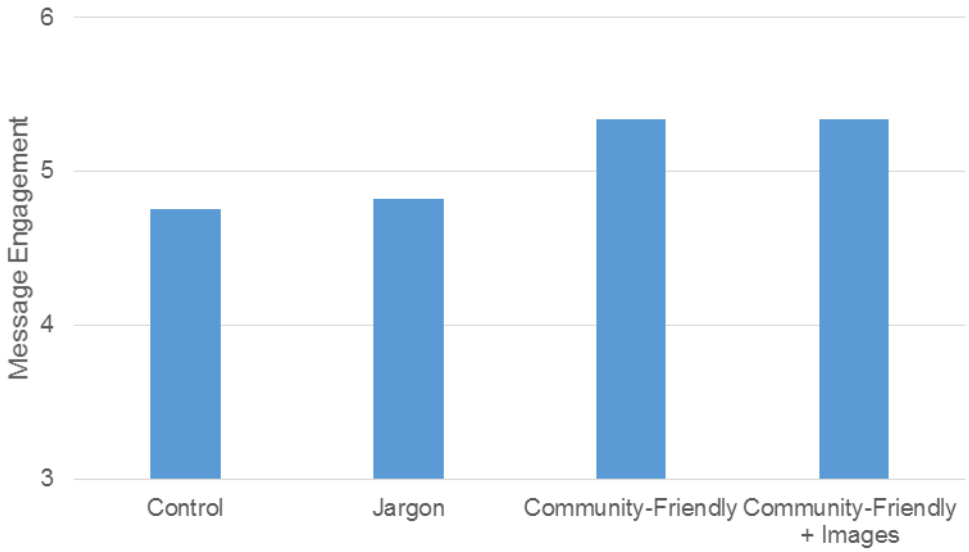
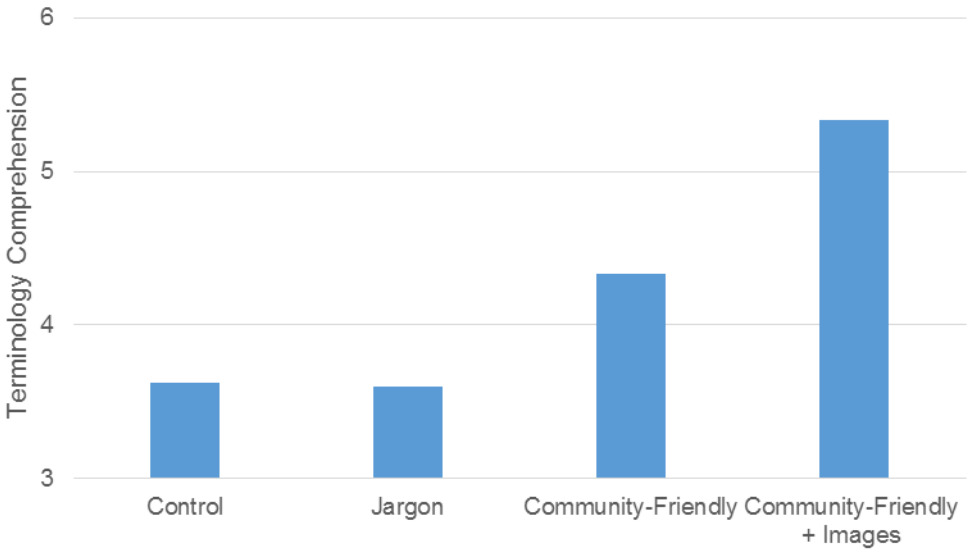


Figure 8: The effect of terminology on message engagement for all participants.

Terminology comprehension

The use of jargon influenced the degree to which participants' understood the words and concepts used in the message, $F = 14.92$, $p < .001$ (Figure 9). Further testing showed that, in comparison to the jargon message group ($M = 3.60$, $SD = 0.84$), the use of community friendly-terminology ($M = 4.17$, $SD = 0.80$) or community-friendly terminology plus images ($M = 4.33$, $SD = 0.69$) led to higher perceptions of message comprehension, p's $< .001$. There was no difference between the control ($M = 3.63$, $SD = 1.00$) and jargon groups, $p = .779$, and no difference between the community-friendly and image groups, $p = .302$.

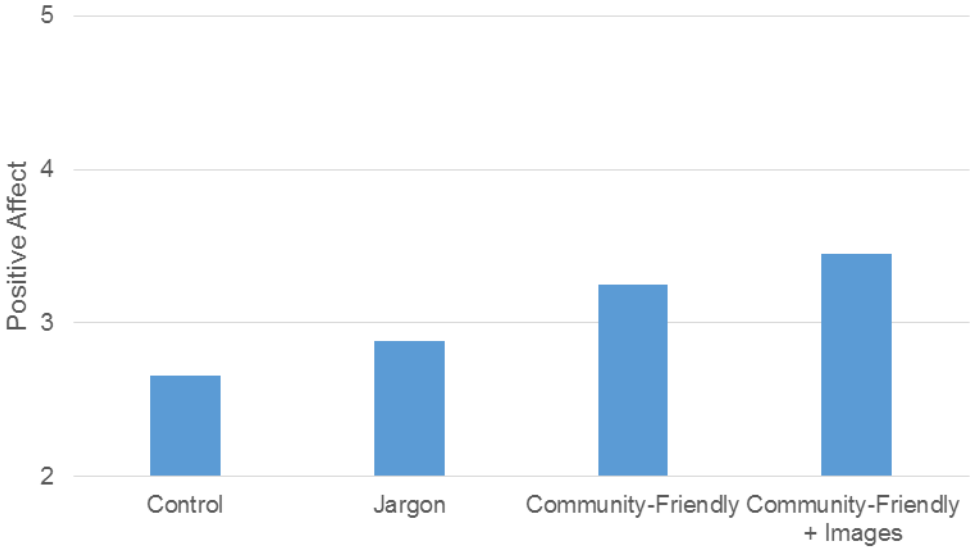


Comprehension was higher when messages used community-friendly terminology

Figure 9: The effect of terminology on comprehension for all participants.

Positive and Negative Affect

Using different terminology and visuals to convey information about stormwater management influenced the degree to which participants reported feeling positive emotion in response to the information, $F = 12.76$, $p < .001$ (Figure 10). In comparison to the jargon condition ($M = 2.88$, $SD = 0.85$), the use of community friendly-terminology ($M = 3.25$, $SD = 0.96$) or community-friendly terminology plus images ($M = 3.45$, $SD = 0.77$) led to higher levels of positive emotion, p's < .005. Further testing showed that there was no difference between the control ($M = 2.66$, $SD = 0.90$) and jargon conditions, $p = .132$. There was also no difference between the community-friendly and image conditions, $p = .161$.

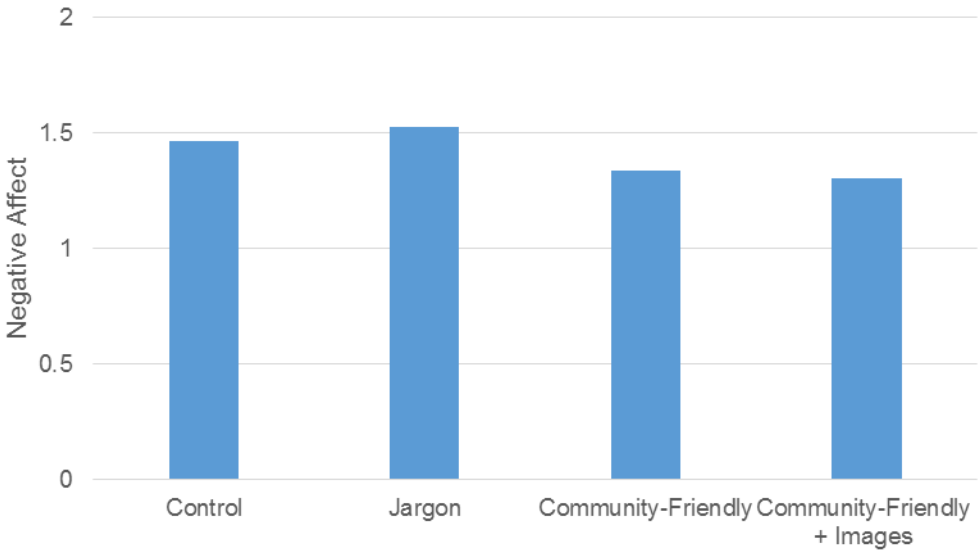


Positive affect was higher when messages used community-friendly terminology

Figure 10: The effect of terminology on positive affect for all participants.

Similarly, using different terminology and visuals to convey information about stormwater management influenced the degree to which participants reported feeling negative in response to the information, $F = 3.79$, $p = .011$ (Figure 11). In comparison to the jargon message ($M = 1.53$, $SD = 0.57$), the use of community friendly-terminology ($M = 1.34$, $SD = 0.58$) and images ($M = 1.30$, $SD = 0.49$) led to lower levels of negative emotions, p's < .007. Further testing showed that there was no difference between

the control (*M* = 1.46, *SD* = 0.64) and jargon message groups, *p* = .236. There was also no difference between the community-friendly and image message groups, *p* = .096.

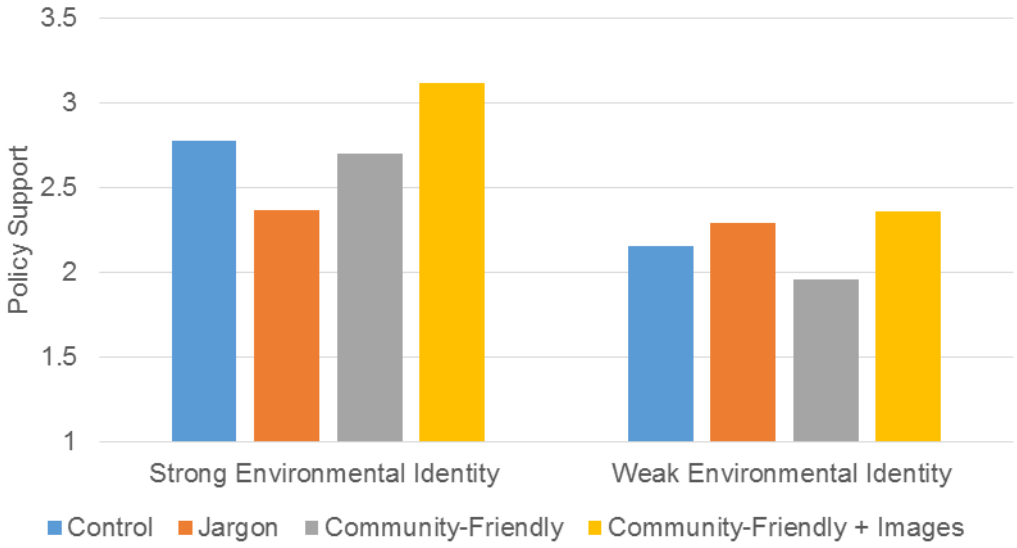


Negative affect was lower when messages used community-friendly terminology

Figure 11: The effect of terminology on negative affect for all participants.

Willingness to support WSUD

Using different types of terminology and visuals had no effect on the participants' willingness to support WSUD when the initiatives had no or minimal impact on their council rates. However, participants' willingness to support initiatives that would have a large impact on their council rates (i.e., up to $200 per year extra) depended on both the terminology used as well as the strength of their environmental identity, *p* = .026 (Figure 12). More specifically, for participants who strongly identified with environmental causes, the use of community-friendly terminology and/or images led to higher levels of policy support (point estimate: 0.54, CI: 0.11 to 0.98). Using jargon or community-friendly terminology made no difference to people with lower or moderate environmental identities.



Policy support was significantly higher when messages used community-friendly terminology for people with strong environmental identities

Figure 12: The effect of terminology on willingness to support WSUD, with a large impact on council rates, for participants with either weak or strong environmental identities.

Willingness to share information

The effect of using different terminology and visuals on participants' willingness to share information depended on how strong their environmental identity was, $p = .018$ (Figure 13). For participants with a weaker environmental identity, the different message versions did not lead to any change in their willingness. However, at moderate and high levels of environmental identity, the use of community-friendly and image conditions led to higher willingness to share information with others in comparison to the jargon message condition (point estimate: 0.26, CI: 0.01 to 0.47).

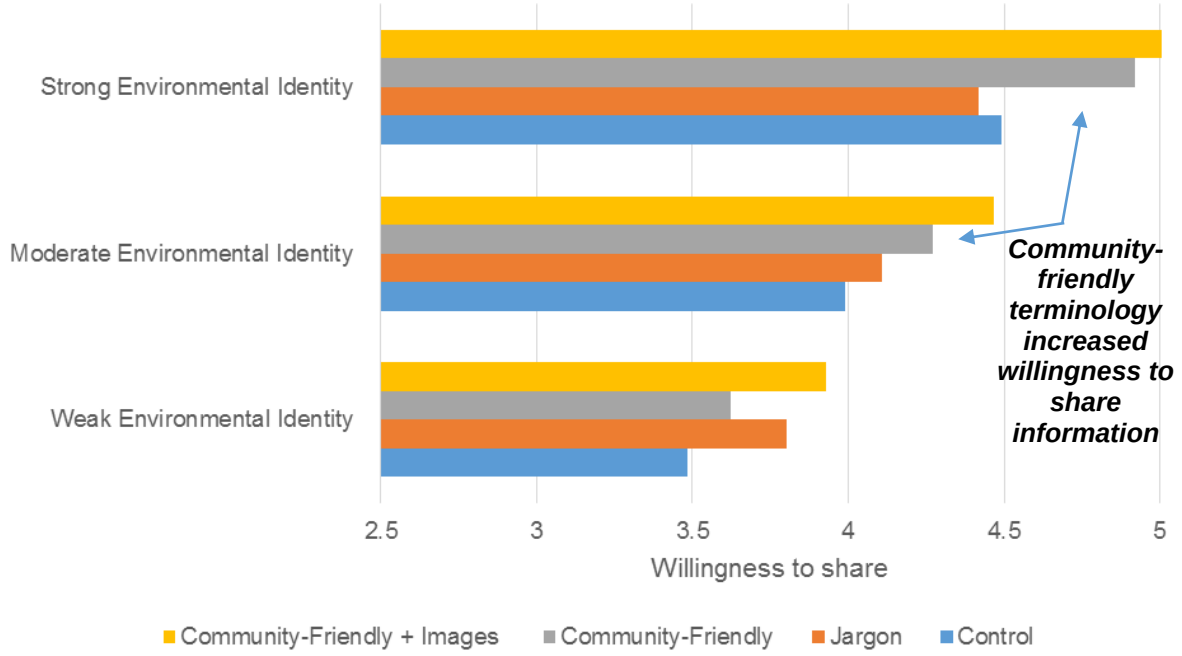


Figure 13: The effect of terminology on willingness to share information with others as a function of environmental identity.

Trust in message information

The use of jargon or community-friendly terminology influenced the degree to which participants' trusted the information contained in the message, $F = 9.38$, $p < .001$ (Figure 14). In comparison to the jargon message ($M = 3.97$, $SD = 0.76$), the use of community friendly-terminology ($M = 4.35$, $SD = 0.66$) and images ($M = 4.34$, $SD = 0.69$) resulted in higher levels of trust in the information, p's = .001. However, there was no difference between the control ($M = 3.63$, $SD = 1.00$) and jargon message groups, $p = .447$ or between the community-friendly and image conditions, $p = .880$.

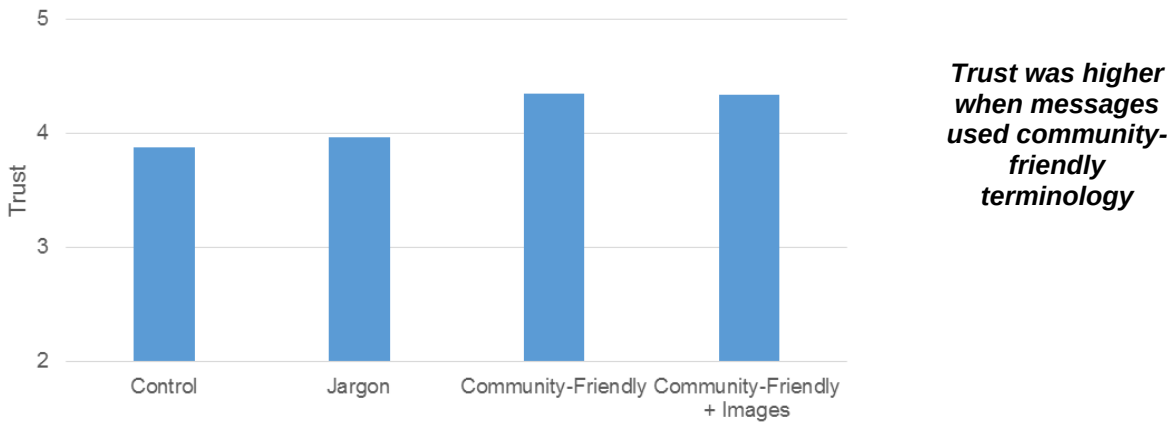


Figure 14: The effect of terminology on trust in message information for all participants.

Study 3: Image Q Sort

Who was surveyed?

Twenty-three community members from Brisbane, Queensland were recruited by an external social research company and received compensation for taking part. Note that the small sample size is in accordance with recommendations for this methodology (Brown, 1980). Participants came from diverse backgrounds (see Table 7), with ages ranging from 19 to 66 years (*M* = 43.30, *SD* = 16.00).

Table 7: Summary of participant characteristics

Demographic	Total Sample N = 23	
Age	Under 35 35 to 50 Over 50	9 (39.1%) 6 (26.1%) 8 (34.8%)
Gender	Males Females	11 (47.8%) 12 (52.2%)
Education	School/Trade/Diploma University	10 (43.5) 13 (56.5)
Domestic dwelling type	House – large garden House – medium garden House – small garden Apartment/townhouse – small garden Apartment/townhouse – no garden	3 (13.0%) 8 (34.8%) 2 (8.7%) 8 (34.8%) 2 (8.7%)

What was measured?

This study empirically tested **how images influence individuals' engagement with water sensitive urban design (WSUD).** Prior research suggests that engagement can occur when an image:

- evokes or elicits an ***emotional connection*** (Sleenhoff et al., 2015)
- is perceived to have ***personal relevance*** *(Petty & Cacioppo, 1986)*
- is perceived as ***relevant to the topic*** being communicated (Kidwell et al., 2013)

The study used an image sorting technique called Q-methodology (O'Neill, Boykoff, Niemeyer, & Day, 2013; Sleenhoff et al., 2015; Swaffield & Fairweather, 1996). Q-methodology elicits people's reactions to the images through a process of one-on-one interviews (called Q-sorts) whereby participants sort and rank the images (called Q-sets) in response to the dimension in question (i.e., emotion, personal relevance and topic relevance). In addition to producing quantitative data used to rank the images, participants are requested to verbalise their decision-making processes during the Q-sort, thus producing qualitative data that is used to provide insight into the ranking process (Dziopa & Ahern, 2011; Sleenhoff et al., 2015).

The images selected for use in the Q-sort were identified through an audit of online communication materials about Water Sensitive Urban Design (e.g., websites, online fact sheets, Facebook pages, and policy documents of government agencies and community groups). In all, 70 images were selected as a broad sample of the types of images commonly used in these contexts. A description of all 70 images is provided in Appendix C. For the purposes of the analysis, the collection of images were categorised in the following way: water sensitive urban design (i.e., raingardens, wetlands and greenwalls); traditional stormwater infrastructure (i.e., drains and outlets); flood events; and bodies of water receiving stormwater (i.e., oceans, creeks and rivers).

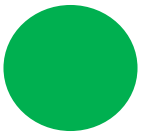
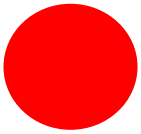
What was found?

The quantitative data from each Q-sort were subjected to inverted factor analysis using the PQMethod computer software program (Schmolck, 2014). This approach allows for the identification of sub-groups of people defined in terms of the category of images the sub-group members felt were highly emotive, highly relevant to the topic of stormwater management, or highly personally relevant.

For the emotion dimension, two sub-groups of participants were identified. The larger of the sub-groups consisted of 14 participants, with seven participants in the second sub-group[1]. Two distinct sub-groups also emerged in relation to the topic-relevance dimension. The larger sub-group consisted of 17 participants, with five participants in the second sub-group[2]. The image rankings with respect to personal relevance produced highly variable responses, as evidenced by the emergence of five sub-groups. The largest sub-group had eight participants, with the remaining four sub-groups containing three participants in each[3]. Individual factor loadings for each of the participants can be found in Appendix B.

For each sub-group each image was given a normalised factor score for each of the three dimensions (scores ranged from -6 through to 6).This '*idealised sort*' for each of the sub-groups represents a distinct pattern of preferences amongst the participants on each dimension (i.e., positive emotion, personal relevance, topic relevance). The report summarises the factor scores using a traffic light system (see Table 8). Images with factor scores ranging from +4 to +6 are considered high scores for that dimension and are given a green traffic light. Images with scores ranging from -3 to +3 are considered moderate scores for that dimension and are given an orange traffic light. Images with negative factor scores ranging from -4 to -6 are considered low scores that dimension and are given a red traffic light.

Table 8: Traffic light system for the classification of each category is images according to each dimension.

Traffic light system	Emotion	Topic Relevance	Personal Relevance
	*The image elicited strong positive emotions*	*The image is most relevant to the topic of stormwater management*	*The image is the most personally relevant*
	*The image elicited weak or neutral emotions*	*The image is somewhat relevant to the topic of stormwater management*	*The image is somewhat personally relevant*
	*The image elicited strong negative emotions*	*The image is the least relevant to the topic of stormwater management*	*The image is the least personally relevant*

The following sections outline the results of the Q-sort for each category of images and for each of the three dimensions. The full list of all 70 images and their factor scores can be found in Appendix C.

[1] The Q-sorts from two participants were removed as they failed to load onto a single sub-group.
[2] The Q-sort from one participant was removed as they failed to load onto a single sub-group.
[3] The Q-sorts from three participants were removed as they failed to load onto a single sub-group.

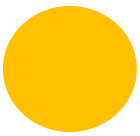
Images of Water Sensitive Urban Design

Images 2, 18, 19, 33, 34, 40, 49, 50, 51, 52, 53, 56, 61, 63, 66, 67 (refer to Appendix C)

On the whole, images of Water Sensitive Urban Design initiatives, like raingardens, tree-pits, greenwalls and wetlands, elicited a very neutral response from all participants surveyed, across all three dimensions. Whilst the images did not elicit negative emotions, they failed to elicit strongly positive emotions with most participants responding that they felt neutral about the images. With regard to topic relevance, the participants failed to identify their purpose with regard to minimising the impacts of stormwater on waterway health. Rather, they felt that the relevance was related to rainwater keeping the plants watered and alive. Finally, on the whole, the images were considered only somewhat personally relevant. However, images that were considered familiar or that depicted people in the image were ranked higher for personal relevance than other images.

- Image 67 (pictured right), of a raingarden with a visible grate, scored the highest in terms of topic relevance (Scores: +2 and +4).
- Image 52, of a raingarden with people visible, scored the highest for positive emotion (Scores: +3 and +1) and personal relevance (Scores: +3, 0, +3, -2, +2).
- Image 66, a green-wall, received the highest scores for this category of images in terms of both positive emotion (scores: +2 and +3) and personal relevance (scores: +1, +1, +4, +2, +4), but low for topic relevance (scores: -2 and -4).
- Image 50, a tree-pit, performed the worst across all three dimensions.

Figure 15: Image 67 - Raingarden (Source: Healthy Land and Water)

Elicited weak or neutral emotions		*"Getting towards neutral – these are just more it's nice to be able to go for a walk in the urban space with different sort of uses of vegetation."*
Somewhat relevant to the topic		*"I just associate gardens with rain, and they need water"*
Somewhat personally relevant		*"Looks like a new estate, don't live in a new estate, but it's familiar"*

Images of stormwater infrastructure

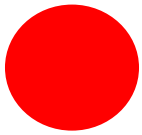
Images 1, 12, 17, 37, 39, 41, 59, 62, 70 (refer to Appendix C)

The response to images of traditional stormwater infrastructure (e.g., drains, pipes and outlets) were very consistent. Unsurprisingly, these images were ranked by participants as being the most relevant to the topic of stormwater management. The images did not elicit positive emotions for any of the participants. They did, however, elicit negative emotions like disgust and anger, despite participants often recognising that the depicted infrastructure plays a necessary role in the management of stormwater in cities and towns. Lastly, images of traditional stormwater infrastructure were ranked amongst the least personally relevant.

- Image 59 (pictured right), which depicted a gross pollutant trap, elicited the strongest negative emotions across all 70 tested images (scores: -6 and -6).
- The images that included visible rubbish, elicited the most negative emotion and were ranked the least personally relevant.

Figure 16: Image 59 - Pollution trap (Source: Melbourne Water)

Elicited strong negative emotions



"Unpleasant, because it's a lot of rubbish trapped and it's obviously there for that purpose. So the system is kind of working in that we have something in place to trap rubbish, but the rubbish is still there"

Most relevant to the topic

"The ones that are most relevant are ones with drains"

"More of these ugly grids, cement, they're an eye sore – very relevant."

Least personally relevant

"Rubbish in the gutter…I hate that…it's least relevant to me because I do the right thing and encourage people to do the right thing"

Images of swales/bio-filtration basins

Images 30, 54, 64, 65 (refer to Appendix C)

Four images of swales were included in the Q-sort. Like the images of Water Sensitive Urban Design, the images received a very consistent but neutral response across the three different dimensions assessed.

- Of the four swale images, an image depicting a swale under construction (Image 54, pictured right) received the lowest scores, in comparison to the other swale images, for both positive emotion (scores: -3 and -4) and personal relevance (scores: -4, -1, -2, -5, +1).

Figure 17: Image 54 - Swale (Source: New WAter Ways)

Elicited weak or neutral emotions

"It's just a park in the suburbs, which is kind of my new environment and I just got a dog on Saturday and we go on lots of walks and that's kind of, it's got that positive connection to walking my dog"

"I feel nothing about it at all."

Somewhat relevant to the topic

"Start of some sort of control measure to divert water"

"Looks like land that's been sculptured to capture water to go into a drain"

Somewhat personally relevant

"Shows urban setting, which does not resonate as strongly as natural settings"

"That's a really familiar looking scene…I don't know where it is but it's quite familiar with the suburban area that I live in now"

Images of rainwater tanks

Images 68 and 32 (refer to Appendix C)

Two images of rainwater tanks were included in the Q-sort. The images received a very consistent response, both across participants and across the three different dimensions assessed. Whilst the participants had positive emotional reactions to rainwater tanks, they were not ranked as highly as images of water in natural settings (see "Images of Water" section below). In terms of topic relevance, participants considered the tanks as somewhat relevant to the topic and indicated that they understood the role of the water tank in capturing rainwater for alternative uses, such as watering the lawn. In terms of personal relevance, again the images fell at the mid-way point of the scale, with those people that either had or desired a rainwater tank placing the images higher on the personal relevance scale.

Figure 18: Image 32 - Rainwater Tank (Source: Healthy Land and Water)

Elicited weak or neutral emotions

"It's nice to see the rainwater tanks making a comeback"
"Great, but a more neutral response"

Somewhat relevant to the topic

"The link here is how to divert stormwater and use it for other purposes"

Somewhat personally relevant

"Not as relevant to me, we don't have tanks"

"We put water tanks in because of the drought"

Images of water

Images of pristine, inland bodies of water in rural settings

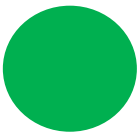
Images 4, 6, 14, 22, 23, 29, 55 and 57 (refer to Appendix C)

All participants had strong positive emotional reactions to pictures of creeks, rivers, and dams, including the two images that included animals that inhabit creeks and rivers (Image 6: Water Dragon and Image 55: Swans). Participants commonly use words like *"beautiful", "calming", "nice"* and "*clean*" to describe the images. Although the majority of participants understood that rainfall eventually flows into rivers and creeks, the images were still not ranked highly in terms of relevance to stormwater management in cities and towns. One explanation for this is that participants highlighted the distance of these waterways from urban areas. Generally, the images were seen as somewhat personally relevant, with the relevance being largely tied to how familiar the image was. That is, the more familiar the image, the higher the perceived level of personal relevance.

Figure 19: Image 17 - Waterfall (Source: Melbourne Water)

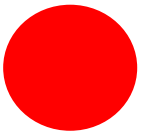
- Image 57 (pictured above right), which depicted a small waterfall flowing into a creek, was one of the highest scored images in terms of positive emotion (scores: +6 and +5)
- Amongst this category of images, those that included animals (Images 6 and 55) were ranked by half of the participants as highly personally relevant.

Elicited strong positive emotions



"It's a peaceful creek in the bush and I like that"

Least relevant to the topic



"Not as relevant because it's showing more remote waterways - not as quickly or directly affected"

Somewhat personally relevant

"[This image] triggers a camping memory"

"Just looks like a creek, pretty boring"

Images of pristine ocean environments

Image 11, 21, 24, 25, 26, 31 (refer to Appendix C)

Images of pristine ocean environments depicting underwater shots of coral, aerial shots of islands, and images that included ocean animals such as turtles and dolphins, were given the highest rankings in terms of positive emotion. However, there was a discrepancy between two sub-groups in terms of topic relevance. The majority of participants failed to identity the relevance of ocean imagery to stormwater management and consequently ranked the images as the least topic-relevant. The smaller sub-group of participants ranked the images as highly topic relevant. The images received a mixed response with regard to personal relevance: two of the personal relevance sub-groups, including the largest of the group, scored the images highly for personal relevance, two of the sub-groups had a neutral response to the images and the final sub-group considered the images personally irrelevant.

- Across all 70 images included in the study, Image 11 (pictured right), which showed a turtle swimming in the ocean, was ranked the highest in terms of positive emotion (scores: +6 and +6)
- Image 24, which depicted a dolphin being handfed, scored +5 for positive emotion by the smaller subgroup, however was given a score of +1 by the larger sub-group. People objected to the dolphin being hand-fed.

Figure 20: Image 11 – Turtle (Source: Brisbane City Council)

Elicited strong positive emotions

"Beautiful setting. Looks very relaxing. I'd like to be there"

"That's what I love to see"

Least to most relevant to the topic

"The ocean's always been around and I don't necessarily associate it with stormwater"

"*It's relevant in the sense that it gets into the stormwater drains and then goes out to sea"*

Varied personal relevance

"I grew up in North Queensland, so the coast and the environment are important to me"

"I am not a beach person, all these open ocean type images are not part of my normal experience"

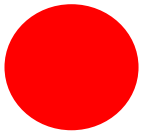
Images of ocean environments with plastic

Image 28 and 43 (refer to Appendix C)

The images of a plastic bag floating in the ocean (pictured right) and an image of a turtle ingesting plastic elicited very negative emotional responses; indeed, the images elicited sadness. However, consistent with the response to the images of pristine ocean environments, the images received a mixed response with regard to the relevance to the topic: one sub-group identified that the images were highly relevant to the topic of stormwater management (scores: +5 and +5), but the larger subgroup ranked the images below the mid-way point of the scale (scores: -3 and -2). Similarly, the images received a very mixed response with regard to personal relevance.

Figure 21: Image 28 – Plastic bag in ocean (Source: Healthy Land and Water)

Elicited strong negative emotions



"I want to cry when I look at that, it's terrible, it shouldn't happen"

Somewhat to least relevant to the topic

"Not as relevant because it's showing more remote waterways - not as quickly or directly affected"

"It shouldn't happen, and very important for stormwater management"

Varied personal relevance

"Is just plastic in the water, that talks to me more than anything. That upsets me very much. We could do something about it but we don't"

"Least relevant – that is something you would see scuba diving which is something I have never done"

Images depicting flood events

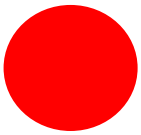
Images of flooding

Images 7 and 27 (refer to Appendix C)

Two images were included of flood events, one depicting a flash flood of a sports field (Image 27, pictured right) and the other was an aerial shot of Brisbane City in flood (Image 7). Overwhelmingly, the participants indicated that the images elicited the negative emotion of sadness. However, there was a split response when it came to topic relevance. While the majority of participants indicated that the images very highly relevant to the topic of stormwater management, the smaller sub-group ranked the images as somewhat topic-relevant. This was because this sub-group of participants considered images of ocean environments as more important to the idea of stormwater management in cities and towns. The flood images were consistently ranked around the mid-way point of the scale with regard to personal relevance, with participants who had personally experienced a flood event ranking them higher than other participants.

Figure 22: Image 27 - Flooding (Source: Brisbane City Council)

Elicited strong negative emotions



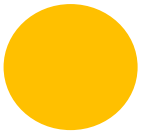
"Flooding is no good for anybody, people lose so much through that, their homes, their memories, their photos, so it's unpleasant"

Somewhat to most relevant to the topic

"That's relevant in its own way"

"The floods are always going to happen here"

Somewhat personally relevant



"Got caught in the floods, pretty relevant"

"Very impactful, not to myself personally but brings back that kind of memory"

Images of flood clean-up activities

Images 20 and 60 (refer to Appendix C)

Figure 23: Image 60 - Flood clean-up (Source: Healthy Land and Water)

Two images were included of people cleaning up after flood events. The majority of the participants ranked these highly with regard to positive emotion. Participants commonly reported that they felt pride and a sense of belonging in response to this category of images. However, a small sub-set of participants ranked the images around the mid-way point of the emotion scale. Participants in this sub-set indicated that they felt sad or disappointed that people needed to clean-up due either a flood event or to due human pollution. With regard to topic-relevance, despite receiving scores in the mid-range of the scale, the large majority of participants indicated that they understood the relevance of these images with regard to stormwater and flooding, it was just that the images were displaced by other images thought to be more representative of the dimension. These images were also ranked as personally relevant by all participants. This is the only category of images received all positive scores for personal relevance.

- Image 66, depicting the Brisbane "Mud Army" after the 2011 flood event, was the one of the highest scoring images in terms of personal relevance across all 70 images included in the Q-sort (scores: +4, +5, +4, 0, +1).

Elicited weak to strong positive emotions

"It's great how the community comes together when it's needed"

"*Makes me feel pretty sad about all that"*

Somewhat relevant to the topic

"Here is people tiding up after, picking up things that have washed down after flood"

"Not sure if they are exactly stormwater related or just caring for waterways related"

Highly personally relevant

"I like these because at least they are trying to do something" (ID10).

Images depicting people

People engaged in recreation activities

Images 8, 9, 35, 38 and 42 (refer to Appendix C)

This set of images included people engaged in water activities such as surfing, boating and fishing, as well as images of people alongside waterways. These images were consistently ranked near the mid-way point or at the top of the scale in terms of both positive emotions and personal relevance. Note that it was extremely rare to have a group of images whereby the large majority sat above the mid-way point on the personal relevance dimension, as was the case for this category of imagery. In contrast, these images were consistently ranked at the bottom of the scale in terms of topic relevance.

Figure 24: Image 9 - Bike rider (Source: Brisbane City Council)

- Image 9 (pictured above), of a bike rider along the Brisbane River, was one of the highest ranked images with regard to personal relevance (scores: +1, +5, +2, +6, +4) out of all 70 images, as well as having a high score for positive emotion (scores: +4 and +3).

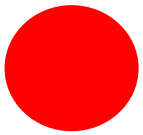
Elicited strong positive emotions

"Strong connection, I've walked up and down that little stretch of bikeway many many times"

"Pleasant experience"

"I like the people paddling in natural sort of setting, in a natural way"

Least relevant to the topic



"Not really relevant – more about leisure time"

"Not relevant to stormwater"

Somewhat to highly personally relevant

"Very relevant to me as I ride along the bike track"

"Recreation is important to me"

"Boating is not something I am interested in"

Images depicting cityscapes

Images 10, 13, 15, 45 (refer to Appendix C)

Although the majority of participants had a neutral response in terms of emotion to images depicting cityscapes, a smaller sub-group had a strong positive emotional reaction. Participants in the smaller sub-group expressed pride and happiness as residents of the capital city depicted in the image. The participants had a moderate response in terms of topic relevance. The group was split in terms of personal relevance, with just under half of the participants having a neutral response and the remaining participants ranking the images highly with respect to personal relevance. The reasons given were similar to those given in relation to the emotional ranking.

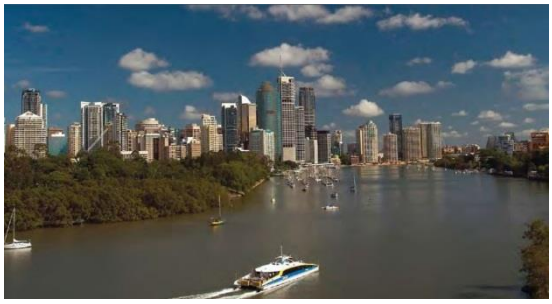


Figure 25: Image 13: Brisbane city (Source: Brisbane City Council)

Elicited weak to strong positive emotions

"It's Brisbane, the river, the city cat - which is one of the most positive things we have had in Brisbane for a long time…it's such a lovely way to travel"

Somewhat relevant to the topic

"The shots of the river I've moved back a little bit because it takes a bigger storm to affect the river than a small creek."

"Brisbane River relevant to capture stormwater"

Somewhat to highly personally relevant

"Because I'm some-one who has lived in Brisbane my whole life, I love Brisbane, I think it's a beautiful city at night, and that's a really lovely photo of it"

Study 4: Image that elicit disgust

An outcome of the image Q sort study was that images of stormwater, water pollution and degraded waterways commonly elicit the emotion of disgust. The dual processing theories used in social psychology suggest that how individuals emotionally respond to stimuli can have flow on effects in terms of how they process and engage with the stimuli (Petty & Wegener, 1998). Therefore, two studies were conducted to assess the effect of images that elicit disgust on how community members process and engage with messages about stormwater management.

Who took part?

Study 1

A survey of community members in urban areas of Queensland, New South Wales, Victoria, and Western Australia was conducted in June 2016. The sample of 235 adult participants was recruited from a permission based social research panel and each participant received a small amount of compensation for taking part. Participants who indicated that their primary language was not English were excluded from the study (n = 39). As Table 9 shows, there was a broad age and income range. However, there was a slightly higher proportion of females and a high proportion of participants who had undertaken university study in the sample. The distribution of participants according to state was of the national population.

Study 2

A survey of community members from Melbourne, Victoria was conducted in February 2017. A total of 388 adults were recruited from a permission based social research panel (separate to the panel used in Study 1) and each received a small amount of compensation for taking part. Participants who indicated that their primary language was not English were excluded from the study (n = 20). As Table 9 shows, there was an even split on gender and a broad age range. However, again there was high proportion of participants who had undertaken university study in the sample. This sample also had a high proportion of high income earners (i.e., earning over $70,000).

Table 9. Summary of participant characteristics from Study 1 and 2

Demographics		Study 1 N = 235	Study 2 N = 388
Age	Mean Range	52.4 years 19-83 years	48.9 years 18-87 years
Gender	Males Females Other/Not reported	99 (42.1%) 135 (57.4%) 1 (0.4%)	189 (48.7%) 197 (50.8%) 2 (0.5%)
State	Victoria New South Wales Queensland Western Australia	106 (45.1%) 78 (33.2%) 35 (14.9%) 16 (6.8%)	388 (100.0%) - - -
Education	School Trade/Diploma Under-graduate Post-graduate	77 (32.7%) 55 (23.4%) 61 (26.0%) 42 (17.9%)	110 (28.4%) 117 (30.2%) 104 (26.8%) 57 (14.7%)
Income*	Less than $40,000 $40,001 to $70,000 $70,001 to $100,000 More than $100,000 Prefer not to say	63 (26.8%) 64 (27.2%) 43 (18.3%) 58 (24.7%) 7 (3.0%)	60 (15.5%) 89 (22.9%) 118 (30.4%) 121 (31.2%) 0

*Total annual household income before tax

What was tested?

Study 1

In the first online experiment, participants were randomly allocated to one of three groups. In the two experimental groups participants received a stormwater factsheet with an image that elicited either a high or low level of disgust (see Figure 26). In the control condition, participants received the factsheet without any embedded image. Each factsheet provided the same information about stormwater pollution and outlined some stormwater management initiatives that can be undertaken by individuals and local government agencies. The full version of the factsheet can be seen in Appendix D. After reading the information, participants completed a survey which measured the concepts described in the following section.

Figure 26: Images used in the experimental study to elicit low (left image) and high (right image) levels of disgust.

Study 2

For the second online experiment, participants were randomly allocated to one of two experimental groups (factsheet with image that elicited disgust or factsheet with an image that elicited sadness; see Figure 27), or to a control group that did not see any image. The content of the factsheet was the same as Study 1. After reading the information participants completed a survey which measured the concepts described below.

Figure 27: Images used in Study 2 to elicit disgust (left image) and sadness (right image).

What was measured?

The same constructs were assessed across both studies. Participants answered a number of basic demographic and individual difference questions, such as their environmental identity. After reading their allocated factsheet, participants were asked a number of questions designed to measure various aspects of their engagement with the factsheet content, such as:

- Depth of processing
- Factsheet appeal
- Message recall
- Willingness to share information with others
- Willingness to support WSUD
- Information seeking intentions

An explanation of how each of these variables was measured is provided in Table 10.

Table 10. Summary of questionnaire content

Variable Name	Question Items	Response Options	Scale Reliability Score[a]
Environmental Identity	Please rate your response to the following statements: • Being environmentally-friendly is an important part of who I am • I am the type of person who is environmentally-friendly • I see myself as an environmentally-friendly person	1 = strongly disagree to 7 = strongly agree	.92 - .94
Depth of processing	Please rate your response to the following statements: • I was able to focus on the content of the factsheet • I concentrated on the content of the factsheet • I paid close attention to each point that was made in the factsheet • I was interested in what the factsheet had to say • I found the factsheet was thought provoking • I was motivated to read the factsheet • The content of the factsheet made me stop and think	1 = strongly disagree to 7 = strong agree	.94 - .95
Willingness to support WSUD	How likely would you support initiatives to manage stormwater pollution in their area if there was: • no impact on your rates or rent? • a small impact on your rates or rent (less than $50 per year)? • a larger impact on your rates or rent (up to $200 per year)?	1 = very unlikely to 5 = very likely.	N/A
Willingness to share information	Please rate your response to the following statements: • I intend to discuss the factsheet contents with others around me • I feel motivated to discuss the issues raised by the factsheet with others around me • I am motivated to persuade others about the importance of taking steps to manage stormwater	1 = strongly disagree to 7 = strongly agree	.94-.96

Variable Name	Question Items	Response Options	Scale Reliability Score[a]
Factsheet appeal	To what extent do you feel that the factsheet was: • Compelling • Persuasive • Interesting • Appealing • Engaging • Easy to understand • Straightforward	1 = Strongly disagree to 5 = Strongly agree	.93 - .94
Information seeking	Please indicate whether you would like to be sent further information about ways to more effectively manage stormwater	0 = No 1 = Yes	N/A

[a]Scale reliability is a measure of how closely related a set of question items are. A minimum score for scale construction is .60

What was found?

All data was analysed using the statistical software package SPSS Version 22. The effect of using images on each of the variables was assessed after first controlling for the effects of age, sex and education.

For each variable, the effect of the experimental conditions was further tested to see if it varied depending on a number of individual characteristics such as whether they owned their own home or the size of their garden. However, only the participants' level of environmental identity moderated their responses to the use of different types of terminology.

Depth of Processing

For both studies, the effect of using disgusting images on how deeply participants processed the contents of the factsheet depended on how strong their environmental identity was, *p*'s < .021 (Figure 28). Specifically, for participants with a weaker environmental identity, images that elicit disgust lowered depth of processing in comparison to the no image group for study 1 (point estimate: -0.43, CI: -0.85 to -0.02) and in comparison to both the no image and sad image group for study 2 (point estimate 0.37, CI: 0.06 to 0.67). For participants with moderate to strong environmental identities, however, the use of the images did not lead to any changes in depth of processing.

For people with less involvement with the environment, images that elicited disgust reduced the extent to which they reported processing the information in the factsheets.

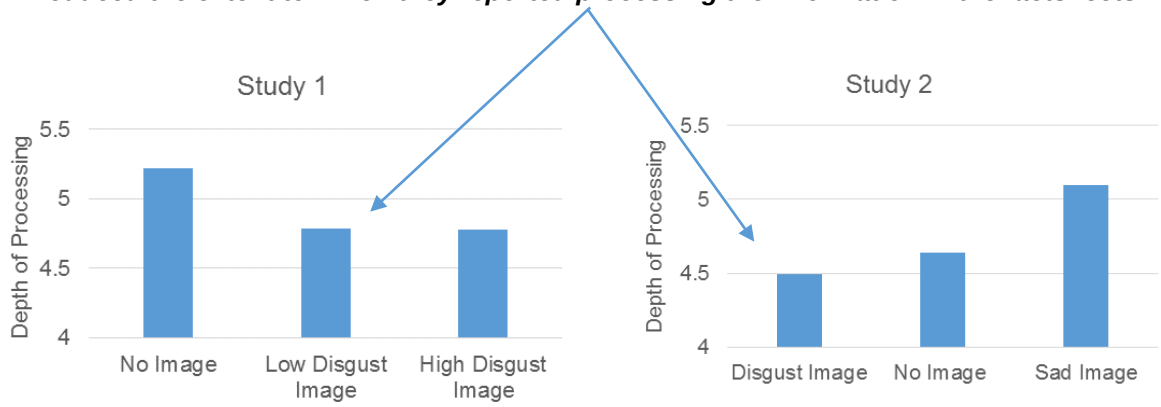


Figure 28: The effect of using disgusting images on depth of processing for participants with a weak environmental identity.

Willingness to support WSUD

Across both Study 1 and Study 2, images that elicited disgust had no effect on participants' willingness to support WSUD when the initiatives had no or minimal impact on their council rates. However, in Study 1, the inclusion of images that elicited disgust led to lower levels of support for initiatives that would have a large impact on the cost of their council rates (i.e., up to $200 per year) for those with a weak environmental identity (point estimate: -0.54, CI: -1.04 to -0.05; Figure 29). Including the images did not influence willingness to support WSUD initiatives for participants with a moderate or strong sense of environmental identity.

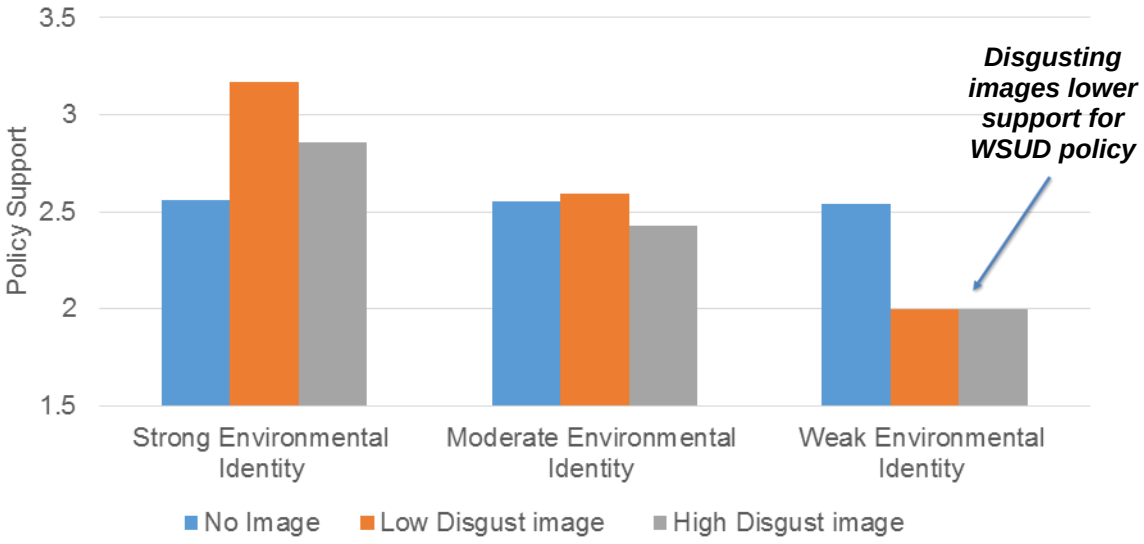


Figure 29. The effect of using disgusting images on willingness to support WSUD as a function of environmental identity for Study 1.

Willingness to share

In Study 2, the effect of using an image that elicits disgust on participants' willingness to share information depended on the strength of their environmental identity, $p < .001$ (Figure 30). For participants with a weak environmental identity, the inclusion of the disgust image resulted in less willingness to share information with others in comparison to both the no image and the sad image conditions (point estimate: 0.56, CI: 0.20 to 0.92). There were no statistical differences between the no image and sad image conditions. For participants with a moderate to strong environmental identity, the experimental conditions had no influence on their willingness to share information with others. For Study 1, the use of disgusting images did not significantly affect participants' willingness to share information with others.

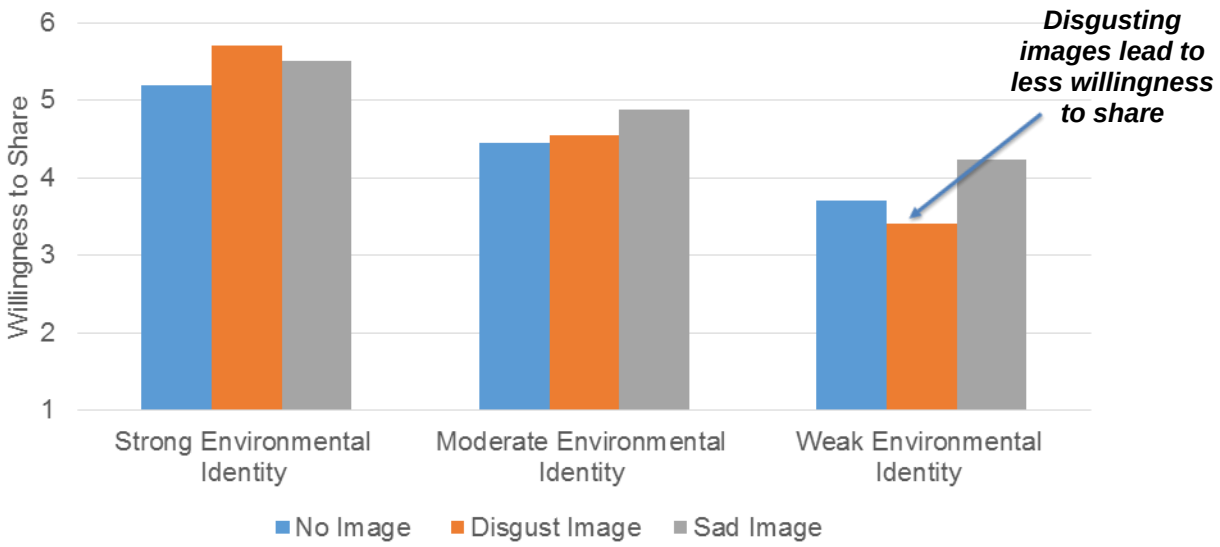


Figure 30: The effect of images on willingness to share as a function of environmental identity for Study 2.

Factsheet appeal

In Study 2, the effect of using an image that elicits disgust on the how appealing the factsheet was to participants depended on the strength of their environmental identity, p = .017 (Figure 31). For participants with a weak environmental identity, the use of the disgusting image resulted in participants reporting that the factsheet was less appealing in comparison to both the no image message and the sad image message conditions (point estimate: 0.36, CI: 0.11 to 0.62). There were no statistical differences between the no image and sad image message conditions. For participants with a moderate to strong environmental identity, the images had no influence on the appeal of the factsheet. For Study 1, the use of disgusting images did not significantly affect how appealing the factsheet was.

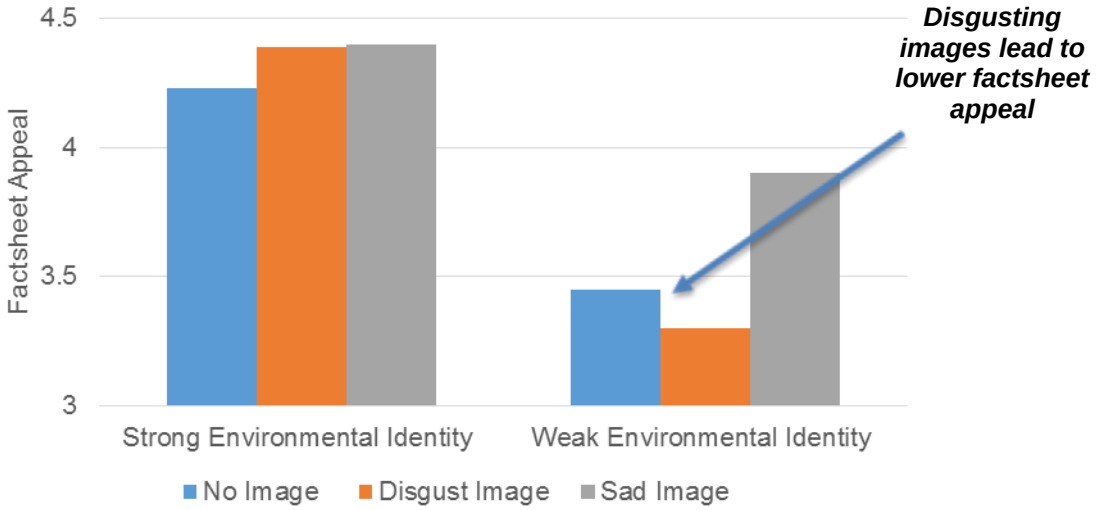


Figure 31: The effect of images on factsheet appeal for participants with either weak or strong environmental identities for Study 2.

Information Seeking

In Study 2, the effect of using an image that elicits disgust on the participants' willingness to receive further formation depended on the strength of their environmental identity, $p = .048$. For participants with a weak environmental identity, the use of the disgust image resulted in participants being less willing to seek further information in comparison to both the no image condition and the sad image message conditions (point estimate: 1.01, CI: 0.15 to 1.88). There were no statistical differences between the no image and sad image messages. Responses to the different message types did not differ for participants with a moderate to strong environmental identity. For Study 1, the use of disgusting images did not significantly affect the participants' level of information seeking.

Summary

Implications for practice

- All engagement and communication initiatives need to identify which group they are aiming to communicate with. Messages intended for “everyone” are unlikely to reach everyone. Our findings indicate that it is important to think about tailoring messages for each target audiences.

- Message content and framing have less effect for individuals with strongly held values (e.g., those who are highly engaged with environmental issues), probably because these individuals have well-developed attitudes that are not easily influenced by exposure to transient messages. We observed minimal effects of messages among individuals whose questionnaire responses indicated greater water-related engagement. Importantly, our strongest message effects were among participants that do not identify as some-one who cares strongly about environmental issues. That is, support for the transition to water sensitive cities was highest when these participants read information that discussed the benefits of water sensitive urban design as a sustainability initiative. This suggests that messages have the potential to generate change in this challenging group.

- As decision makers and advocates need to justify government or private investment in water-related initiatives, persuasive engagement using economic arguments have become more commonly used. While this may be appropriate when communicating with decision makers or investors, our findings suggest that economic arguments should be used with caution when communicating with the public about water sensitive cities. In most experimental groups, this type of message did not generate increased support for water sensitive cities, and in those typically exhibiting high engagement (i.e., those with greater environmental identity), economic messages reduced support.

- Contrary to expectations, messages focusing on sustainability were more influential in individuals more likely to be disengaged. It is not clear why this is the case. Framing theory suggests that the frame may ‘work’ because it (i) activates a new belief about an issue; (ii) make an existing belief more *accessible;* or (iii) *strengthens* an existing belief. Future research is needed to establish the exact pathway through which sustainability measures work for this subgroup of individuals.

- It is important to use terminology more familiar to community members, as it has a positive effect on engagement with messages about water sensitive urban design and support for policy.

- It is recommended that water practitioners avoid the use of images that elicit disgust, as this has negative consequences for message engagement and policy support for individuals that are likely disengaged with water issues.

- When using images of green infrastructure like raingardens and greenwalls, the aesthetics of the infrastructure is important. Choosing images that have flowers or vibrant green foliage will likely elicit more positive emotions and greater engagement.

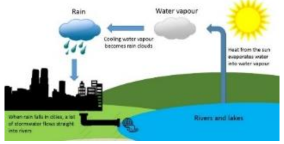
- Use local images as much as possible. The familiarity of images was closely tied to both the degree to which the image elicited positive emotions and the personal relevance of the image.

- Community members have a poor understanding of the link between stormwater management in cities and towns and the wider catchment health. If there is a need to use images of creeks, rivers or oceans it is important to clearly explain the relevance of the image to stormwater management.

- People are engaged by images of people, both in terms of the positive emotion elicited by the image and personal relevance. Showing people how they can use green infrastructure is therefore a meaningful way to engage people with the topic of water sensitive cities.

- Images of flooding and flood clean-up events are an example of images that elicit an emotional connection with participants, are understood as relevant to the topic of stormwater management and are seem as personally relevant by most community members.

Appendix A: Experimental Conditions for Terminology Study

Condition 1 Jargon	Condition 2 Community friendly	Condition 3 Community-friendly + Images	Condition 4 Control
Please read the following information. Afterwards, you will be asked a range of questions about your opinion of these types of initiatives in your area. **New initiatives to manage stormwater pollution** Around Australia local governments and water organisations are working together to address the important issue of stormwater pollution. A range of new initiatives are being planned to reduce the amount of pollutants in stormwater and the negative impact of this pollution on local waterways.	Please read the following information. Afterwards, you will be asked a range of questions about your opinion of these types of initiatives in your area. **New initiatives to manage stormwater pollution** Around Australia local governments and water organisations are working together to address the important issue of stormwater pollution. A range of new initiatives are being planned to reduce the amount of pollutants in stormwater and the negative impact of this pollution on local waterways.	Please read the following information. Afterwards, you will be asked a range of questions about your opinion of these types of initiatives in your area. **New initiatives to manage stormwater pollution** Around Australia local governments and water organisations are working together to address the important issue of stormwater pollution. A range of new initiatives are being planned to reduce the amount of pollutants in stormwater and the negative impact of this pollution on local waterways.	Please read the following information. Afterwards, you will be asked a range of questions about your opinion of these types of initiatives in your area. **New initiatives to manage stormwater pollution** Around Australia local governments and water organisations are working together to address the important issue of stormwater pollution. A range of new initiatives are being planned to reduce the amount of pollutants in stormwater and the negative impact of this pollution on local waterways.
Background information **How water moves through cities** Urban environments alter the way water shifts around the landscape. When rain falls on non-permeable surfaces, it can't be absorbed into the earth. Instead, excess water becomes stormwater and flows through urban streets and drains, before flowing into water courses. **Stormwater pollution** The urban environment contains many pollutants. These include visible pollutants, such as animal faeces, cigarette filters, and synthetic bottles. Non-visible pollutants, such as motor oil and garden chemicals, are also present. Stormwater flows carry pollutants into water courses and river systems. This is called stormwater pollution, which damages aquatic systems and ecosystem health. **Managing stormwater pollution** There are many best management practices available to manage stormwater pollution, and improve outcomes for aquatic and marine ecosystems.	**Background information** **How water moves through cities** Cities change the way water moves around the places we live. When rain falls on roads or concrete, it can't soak into the ground. Instead, excess water becomes stormwater and travels through streets and drains before flowing into rivers and oceans. **Stormwater pollution** There is a lot of pollution in cities. Some pollution is easy to see – like dog droppings, cigarette butts, and plastic bottles. But some pollution is hard to see – like garden chemicals and oil from cars. As rainwater travels through cities, it collects pollution along the way. This pollution is then carried into creeks, rivers and oceans. This is called stormwater pollution and it makes waterways unhealthy. **Managing stormwater pollution** There are many ways to reduce the amount of stormwater pollution and improve the health of rivers and oceans.	**Background information** **How water moves through cities** Cities change the way water moves around the places we live. When rain falls on roads or concrete, it can't soak into the ground. Instead, excess water becomes stormwater and travels through streets and drains before flowing into rivers and oceans.  **Stormwater pollution** There is a lot of pollution in cities. Some pollution is easy to see – like dog droppings, cigarette butts, and plastic bottles. But some pollution is hard to see – like garden chemicals and oil from cars. As rainwater travels through cities, it collects pollution along the way. This pollution is then carried into creeks, rivers and oceans. This is called stormwater pollution and it makes waterways unhealthy.	

Water Sensitive Urban Design (WSUD) is an approach to the planning and design of urban environments that supports healthy ecosystems through smart management of water. WSUD initiatives often involve the installation of plant biofiltration systems to reduce the impact of urbanisation on water systems and to enhance waterway protection. Raingarden biofiltration systems are small and can be installed in the home or local urban environment. Larger biofiltration systems such as constructed surface flow wetlands can also be suitable for some urban environments and can remove stormwater pollutants. Other strategies include replacing non-permeable surfaces with permeable surfaces throughout the city. This can reduce excess stormwater flows and pollutant load of stormwater runoff. These approaches are part of total water cycle management, promoting ecosystem resilience across all parts of the catchment.	One approach is to create areas in cities that remove pollution from stormwater before it gets to rivers and oceans. For example, some plants can remove pollution from stormwater. Special gardens with these plants are called raingardens. These can reduce pollution from the cities getting into waterways. These raingardens can be small, and built in the home or on streets. These plants can also be used in specially-built wetlands or lakes. These can remove pollution from stormwater before it runs into rivers and oceans. Other strategies involve replacing concrete areas with grass or special paving that can soak up excess rain. This can reduce stormwater running through the city catching pollution on the way. These approaches make sure that water is managed in a way that promotes healthy rivers and oceans.	 **Managing stormwater pollution** There are many ways to reduce the amount of stormwater pollution and improve the health of rivers and oceans. One approach is to create areas in cities that remove pollution from stormwater before it gets to rivers and oceans. For example, some plants can remove pollution from stormwater. Special gardens with these plants are called raingardens. These can reduce pollution from the cities getting into waterways. These raingardens can be small, and built in the home or on streets.  These plants can also be used in specially-built wetlands or lakes. These can remove pollution from stormwater before it runs into rivers and oceans.  Other strategies involve replacing concrete areas with grass or special paving that can soak up excess rain. This can reduce stormwater running through the city catching pollution on the way.  These approaches make sure that water is managed in a way that promotes healthy rivers and oceans.	

Appendix B: Factor loadings of participants for each Q sort.

Participant	Positive Emotion		Topic-Relevance		Personal Relevance				
	Sub-group 1 (n = 14)	Sub-group 2 (n = 7)	Sub-group 1 (n = 17)	Sub-group 2 (n = 5)	Sub-group 1 (n = 8)	Sub-group 2 (n = 3)	Sub-group 3 (n = 3)	Sub-group 4 (n = 3)	Sub-group 5 (n = 3)
1	0.7058X	0.3324	0.6160X	0.0916	-0.0854	0.6381X	-0.0298	0.0570	-0.0680
2	0.7812X	0.1590	-0.0336	0.7190X	0.7540X	0.0641	0.1137	-0.2032	0.0370
3	0.5693	0.6539X	0.6404X	0.3072	-0.2778	0.6713X	0.3126	-0.0469	0.1418
4	0.4852X	0.3278	0.6021X	0.1874	0.2474	0.1391	0.5004X	0.1908	0.3767
5	0.6071X	0.3227	0.5746X	0.1063	0.4670	-0.0154	-0.0765	-0.1207	0.5311X
6	0.7365X	0.0801	0.0640	0.6445X	0.6704X	-0.2138	-0.3144	0.3228	-0.0831
7	0.6041	0.6203	0.5827X	0.2236	0.0686	0.0255	0.1332	0.8677X	-0.0457
8	0.6933X	0.3877	0.7023X	0.4340	0.0342	0.1159	-0.0833	0.0548	-0.0346
9	0.5514	0.6815X	0.7919X	0.2744	0.6487X	0.3244	-0.0132	0.2436	0.2514
10	0.4304	0.4038	0.7760X	0.1895	-0.0659	0.0677	0.8113X	0.0182	-0.1072
11	0.2520	0.8361X	0.6087X	-0.0809	0.0717	-0.1922	0.6755X	-0.0967	-0.1700
12	0.2841	0.6511X	0.8561X	-0.0523	0.1867	-0.0419	-0.1397	0.1485	0.7954X
13	0.5451X	0.3562	0.7434X	0.3099	0.7868X	-0.0789	-0.1830	-0.0823	0.2059
14	0.7190X	0.4511	0.8017X	0.0079	0.2416	0.1216	-0.0032	0.3683X	0.0874
15	0.0664	0.7104X	0.7755X	0.1096	0.7145X	0.1018	0.1079	0.0219	0.1992
16	0.3566	0.7880X	0.5789	0.5679	0.4894	0.4609	0.1088	0.1065	0.0067
17	0.6176X	0.5205	0.7721X	0.0835	0.2697	0.1512	-0.0214	0.3082	0.4810X
18	0.3497	0.7024X	0.3349	0.7158X	0.5280X	-0.1063	0.3710	0.3623	0.0644
19	0.6891X	0.5522	0.1962	0.7478X	-0.0274	0.1459	-0.1657	0.6840X	0.2213
20	0.5779X	0.4621	0.0085	0.6708X	0.2309	-0.1118	0.0247	0.0797	0.0871
21	0.6616X	0.3252	0.6385X	0.1988	0.6802X	0.0376	-0.2550	0.1986	0.3207
22	0.7143X	0.4416	0.6522X	0.3763	0.6776X	-0.1839	0.2271	0.2544	0.0002
23	0.7857X	0.2086	0.8172X	0.0324	0.1803	0.8115X	-0.2101	0.1581	-0.0314

Appendix C: Factor scores for all 70 images used in the Q-sort

		Positive Emotion		Topic-Relevance		Personal-Relevance				
		Sub-group 1 (n = 14)	Sub-group 2 (n = 7)	Sub-group 1 (n = 17)	Sub-group 2 (n = 5)	Sub-group 1 (n = 8)	Sub-group 2 (n = 3)	Sub-group 3 (n = 3)	Sub-group 4 (n = 3)	Sub-group 5 (n = 3)
Image 01	Exposed litter trap	-3	-5	6	6	-2	-3	1	3	-3
Image 02	Constructed wetland in new housing estate	-2	-1	3	-1	-3	1	-1	-3	-3
Image 03	Close-up of clear water/rain dripping through hands	4	1	-2	-3	5	5	-5	5	0
Image 04	Close up of water lily	4	2	-4	-3	1	0	0	-4	0
Image 05	Collection of boats out to sea	-1	0	-4	0	-1	-4	-4	4	-2
Image 06	Water dragon in a creek	2	3	-4	2	2	-2	6	-4	-1
Image 07	Aerial shot of Brisbane city during 1974 flood	-4	-5	4	-3	-1	2	3	4	-2
Image 08	Fishing boat in rural creek	0	2	-1	0	-1	-1	-5	1	1
Image 09	Bike rider on path beside Brisbane river	4	3	0	-4	1	5	2	6	4
Image 10	Brisbane city skyline including Story Bridge	0	4	-2	-4	-2	4	3	2	3
Image 11	Turtle in ocean with coral	6	6	-4	4	5	-4	2	5	6
Image 12	Pipes gushing brown water	-5	-2	3	5	-6	-3	0	-3	3
Image 13	Brisbane city skyline including CityCat	-1	4	-1	-2	-2	5	1	4	1
Image 14	Natural wetland/creek with denuded trees	1	2	-1	0	2	-3	-2	2	-4
Image 15	Brisbane city skyline at night	0	5	-2	-3	0	6	2	6	3
Image 16	People beside rural creek	3	2	1	1	3	-2	4	-2	1
Image 17	Stormwater drain with brown water	-3	-3	4	4	-5	-2	0	-2	-3
Image 18	Roadside raingarden with suburban backdrop	-1	-2	1	-2	-1	0	-3	0	-2
Image 19	Constructed wetland with person walking along concrete path	2	1	1	-1	0	4	1	1	-1
Image 20	People picking up rubbish on a riverbank (Clean up Australia Day)	5	-4	3	1	3	0	5	5	2
Image 21	Marine creatures (nudibranchs) on coral	2	5	-6	2	4	-6	-3	-2	4
Image 22	Rural creek with green tones	3	1	0	-5	2	3	-3	-1	0

		Positive Emotion		Topic-Relevance		Personal-Relevance				
		Sub-group 1 (n = 14)	Sub-group 2 (n = 7)	Sub-group 1 (n = 17)	Sub-group 2 (n = 5)	Sub-group 1 (n = 8)	Sub-group 2 (n = 3)	Sub-group 3 (n = 3)	Sub-group 4 (n = 3)	Sub-group 5 (n = 3)
Image 23	Dam with mountain backdrop	3	2	-3	0	2	-1	-5	2	4
Image 24	Dolphin being fed	1	5	-5	3	5	-5	3	0	5
Image 25	Close up of sea grasses	2	1	-3	0	2	-1	-5	0	2
Image 26	Aerial shot of Moreton Island	5	6	-5	3	5	-3	-4	3	5
Image 27	Flash flood at sports field	-3	-4	6	-2	0	4	3	3	-4
Image 28	Plastic bag in ocean with coral	-6	-6	-3	5	6	-1	5	1	-5
Image 29	Rural creek with brown tones	3	2	-1	-1	1	4	-3	0	3
Image 30	Girl walking in shallow, revegetated creek	2	-1	2	-2	2	3	-4	-3	0
Image 31	Aerial shot of coral reef	3	4	-5	3	3	-6	-6	1	6
Image 32	Household, corrugated-iron water tank	1	-3	2	-1	1	1	0	-2	-1
Image 33	Small group planting a raingarden with drain	2	1	0	-2	2	-1	-1	-1	2
Image 34	Small constructed wetland	0	-1	0	-1	0	-3	-1	-2	0
Image 35	People kayaking in rural creek	5	3	-3	1	1	3	-2	4	2
Image 36	Aerial shot of sediment entering Moreton Bay	-3	1	0	4	3	-3	-4	3	-4
Image 37	Roadside stormwater drain with leaf litter	-4	-4	5	4	-3	-4	3	3	3
Image 38	People relaxing in urban parkland beside a river	1	3	-3	-5	1	2	0	1	1
Image 39	Stormwater outlet with brown water	-5	-2	5	3	-3	-2	2	1	-4
Image 40	Constructed wetland in city park	-1	2	1	-1	-2	-2	2	0	0
Image 41	Stormwater outlet at beach	-4	-3	5	3	-4	3	1	2	-1
Image 42	Surfer entering ocean	4	4	-6	-5	3	0	-4	2	4
Image 43	Turtle ingesting plastic on sand	-5	-5	-2	5	6	-4	6	-4	-5
Image 44	People beside rural creek, cleaning up or testing water	1	-2	3	1	4	0	5	-1	2
Image 45	Brisbane - suburb with flower	1	3	-1	-2	-1	-2	0	-1	0
Image 46	Stormwater holding bay	-2	0	1	1	-4	0	1	-1	-4

		Positive Emotion		Topic-Relevance		Personal-Relevance				
		Sub-group 1 (n = 14)	Sub-group 2 (n = 7)	Sub-group 1 (n = 17)	Sub-group 2 (n = 5)	Sub-group 1 (n = 8)	Sub-group 2 (n = 3)	Sub-group 3 (n = 3)	Sub-group 4 (n = 3)	Sub-group 5 (n = 3)
Image 47	Porous paving - close up	-3	-3	-4	-6	-6	-4	-3	-6	0
Image 48	Close up of water puddle with ripple	-1	0	1	-3	0	3	-6	-5	3
Image 49	Raingarden beside multi-level carpark	1	0	0	0	0	2	4	0	2
Image 50	Tree pits in shopping mall with palm trees and tram in background	-2	-1	-2	-6	-3	1	-1	-5	-2
Image 51	Roadside raingarden beside office buildings	-2	-2	-2	-3	-2	2	0	-6	-3
Image 52	Two people planting a domestic raingarden	3	1	-1	-5	3	0	3	-2	2
Image 53	Roadside raingarden with bright flowers	0	0	0	2	-1	2	-2	-3	-3
Image 54	Swale under construction	-3	-4	3	2	-4	-1	-2	-5	1
Image 55	Swans and cygnets in water	4	4	-3	2	4	-2	5	-4	5
Image 56	Close up of PVC downpipe with pebbled raingarden	-1	-1	2	2	-3	1	-1	-5	-1
Image 57	Waterfall in rainforest	6	5	-5	0	4	3	-3	3	5
Image 58	House construction site	-4	-4	1	-4	-5	-2	2	4	-6
Image 59	Gross pollutant litter trap	-6	-6	4	5	-4	-5	2	-2	-6
Image 60	Clean-up after 2011 Brisbane flood (Mud Army)	5	-2	4	1	4	5	4	0	1
Image 61	Constructed wetland with palm trees, inner city	0	-1	2	0	0	1	0	-1	-2
Image 62	Stormwater drain showing leaf litter	-5	-5	4	6	-5	-5	4	5	-5
Image 63	Large raingarden in suburb	-1	-2	0	-2	-2	1	-2	0	-1
Image 64	Swale in council park with no vegetation	-2	0	3	2	-3	6	-2	1	-1
Image 65	Vegetated swale in council park	0	0	2	1	-1	4	-2	-1	-2
Image 66	Greenwall on office building	2	3	-2	-4	1	1	4	2	4
Image 67	Household raingarden with drain	-2	0	2	4	-2	2	-1	-4	-2
Image 68	Household, concrete rainwater tank	0	-3	2	-1	0	0	0	-3	-3
Image 69	Carpark with porous paving	-2	-3	-1	-4	-5	2	-1	-3	-5
Image 70	Underground stormwater holding tank	-4	-1	5	3	-4	-5	1	2	1

Appendix D: Factsheet for Image Study

MANAGING STORMWATER IN CITIES AND TOWNS FACTSHEET

Outside of cities, rainfall can soak into the ground and become a source of water for plants and a way of topping up groundwater. In built up areas, however, there are many non-porous surfaces, like concrete paths, roads and roof-tops; rainfall runs off these surfaces and becomes stormwater.

As stormwater flows across these hard surfaces and enters drains, it can become polluted with litter, chemicals, and soil particles. This is because the stormwater system is separate from the sewer system and is not treated. The polluted stormwater eventually flows into oceans and waterways where it causes harm to plants and animal life. For example, chemicals, like nitrogen and phosphorus, can cause toxic algae blooms. Stormwater runoff can also cause flooding and erosion problems.

Local authorities or water utilities can better manage stormwater by...

- Installing porous paving that allows stormwater runoff to soak into the ground;
- Constructing greenwalls on the outside of buildings so that the plants can filter out the pollution from roof runoff before it enters drains and underground pipes; and
- Using wetlands, either natural or artificial, to collect and filter stormwater before it enters our waterways.

Community members can better manage stormwater by...

- Installing rainwater tanks to store water for later use and to reduce the amount of stormwater entering waterways;
- Installing raingardens to capture and filter stormwater before it enters waterways; and
- Washing cars on the grass to limit the amount of detergents, mud and oil entering waterways.

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