How Climate Change Knowledge and Emotions Influence Community Advocacy

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Given the climate emergency it is critical that all parts of society contribute to addressing climate change. Key motivators for engaging the community to take action on climate change are cognitive and emotional connections. Research shows that effective engagement with climate change requires understanding the causes and consequences and having a personal connection to it. This case study investigates how an Australian Biosphere Reserve governing body, with a mandate for action on sustainability and climate change, engages with the topic. We used free association tasks within semi-structured interviews to determine participants' cognitive and emotive associations with climate change. The findings revealed understanding of climate change causes and impacts consistent with current scientific knowledge. Potential responses to climate change though, were narrowly defined and emotions associated with climate change were mainly negative. Sustainability-focused organisations can be a valuable vehicle for stimulating community action through their extensive networks. Community practitioners may find a process, such as a free association task, helpful to understand cognitive and emotional connections to climate change, as a starting point for understanding a group's motivation to take climate action.

KEY WORDS: Climate change, adaptation, sustainability, biosphere reserve, knowledge, emotion

Introduction

At a global level, society needs to lift its game to achieve the 2030 targets limiting temperature rise to 1.5°C, as warned by the IPCC in 2018. Global emissions must decrease by at least 45% from 2010 levels to achieve this target. However, Australia's greenhouse gas pollution levels have continued to rise since 2015, with little strong policy to reverse this trend in sight. Australia is already experiencing climate change effects: more frequent and severe bushfires, droughts, heatwaves and coastal flooding, as well as a dying Great Barrier Reef due to warming oceans (Hughes et al. 2017). Given the obvious imperative, one might ask why the agenda has progressed so little since the United Nations Framework Convention on Climate Change (UNFCCC) was first negotiated in 1992.

Fielding et al. (2012) found that political affiliation strongly differentiates climate change beliefs, with conservative politicians less likely to support the scientific consensus position on anthropogenic climate change. More recently, Kouser and Tranter (2018: 107) identified that national political leaders influence partisan attitudes, 'with Australian voters following their party leaders when it comes to global climate change policies'. Strong consistent multilevel policy leadership is essential to make the changes needed. This needs to be reflected in the media as well. Media representations of climate change greatly influence, not just knowledge, but also public perceptions and are often fear-inducing (Carvalho and Burgess 2005; Hoijer 2010; O'Neill and Nicholson-Cole 2009).

In 2019, several countries, as diverse as Portugal, Canada, France, Argentina and the United Kingdom, declared a climate emergency. Local governments around the world have similarly signed the declaration making the commitment to take action to address the causes and impacts of climate change. As of May 2020, about 100 local governments across Australia have declared a climate emergency, with the movement calling on elected leaders to initiate a society-wide mobilisation (Cedamia et al. 2020). It requires action of civil society leadership at all levels to extend the influence, to impact media, and make climate action a responsibility of the whole community.

This study investigates the role of a community organisation, the Noosa Biosphere Reserve Board, charged with promoting sustainability and climate change education under the UNESCO Biosphere Reserve (BR) program. Biosphere Reserve nominations are based on the site's significance for biological diversity conservation

and the opportunity to demonstrate approaches to sustainable development on a regional scale. They are intended to provide models for monitoring, research and education on natural and managed ecosystems, where government decision makers, managers, scientists and local people cooperate to conserve and use resources sustainably.

Biosphere reserve managing bodies, as 'third-sector sustainability organisations' (TSSOs), are particularly valuable in disseminating information to their communities. Such organisations can augment efforts by government and the private sector by extending sustainability and climate change outreach within communities (UNESCO 1995, 1996, 2000, 2002, 2005, 2015). They comprise volunteer community advocates who can inform and provide alternative approaches to unsustainable practices, working through their social networks (Cunningham et al. 2016).

A key challenge in addressing the global crisis of climate change is how to motivate the community to take urgent action, given the equivocal state of national, state and, at times, local leadership. We draw on the social psychology discipline to provide insight. Researchers such as Lorenzoni et al. (2007) found that individuals' knowledge of and emotions attached to climate change causes, impacts and potential actions, determine their level of motivation to work on mitigating its impact and adapting to the consequences. Thus designing effective community engagement to motivate action on climate change requires a deeper understanding of a community's perspectives.

Creating community-based climate change engagement activities in a meaningful geophysical context, such as biosphere reserves, can provide the linkage between sustainable approaches to settlements within treasured landscapes and inspire deeper connections with and awareness of climatic impacts (Schweizer et al. 2013). Therefore, to assist sustainability-focused community groups to undertake local climate change initiatives, we propose, as a first step, an assessment of the cognitive and emotive associations with climate change of the membership of this TSSO. This could leverage these community advocates to improve their effectiveness in promoting not only sustainable practices, but action on climate change.

This article reveals the initial lay thinking and emotions associated with climate change of members of a TSSO, the Noosa Biosphere Reserve Board (NBR Board), which is comprised of a Board of Directors and six sector boards comprising economic, environmental and social issues. It presents their present climate change knowledge around three themes: causes, impacts and responses, providing an initial insight into how the participants view climate change and emotions associated with climate change. Given the consistent environmental values evident in the Noosa Council over time (Baldwin and Bycroft 2010), and sustainability orientation of Biosphere Reserve members, one would expect that taking action on climate change would appeal to this group. The Council continues to maintain these values, recently joining the group of local governments declaring a climate emergency.

Theoretical Framework

International research into climate change perceptions include studies into emotional associations of climate change (Leiserowitz 2006; Hoijer 2010). In a Swedish case, emotional anchoring and objectifying of climate change in the media showed an enhanced engagement by the public (Hoijer 2010). However, this and other findings suggest that if the climate change narrative is too heavily laden with negatively emotive scenarios, at least some segments of society may become indifferent or disillusioned (Hoijer 2010; Moser and Dilling 2007). Hence understanding emotive associations is important for groups aiming to motivate action on climate change.

Identifying initial thoughts about what climate change means to the participants can add to understanding how lay thinking of climate change is conceived and framed (Moloney et al. 2014). First impressions matter. Knowing an individual's initial impressions provides valuable original insights into a person's unfiltered thoughts (Hollway and Jefferson 2008). As these associations reveal, recurring linguistic or affective elements analysing associations of a particular group may reveal patterns around specific aspects, such as causality or solutions, or they may present conceptual contradictory or inconsistent elements related to a scientific phenomenon.

Use of a free association process can elicit spontaneous initial unconscious thoughts. The value of uncovering the roots of an individual's understanding, resides in their spontaneity and unconscious logic, potentially revealing incoherences or contradictions (Hollway and Jefferson 2008). Free association techniques eliciting knowledge and emotions about climate change have previously been used to fill a gap into understanding how societal groups perceive climate change in Australia (e.g. Moloney et al. 2014) and in international contexts (e.g. Leiserowitz 2006; Smith and Joffe 2012).

This article reports on findings resulting from free association tasks around initial impressions of knowledge and emotions connected with the term 'climate change' from members of the Noosa Biosphere Reserve Board.

It focuses on one aspect of a larger study delving into the framing of individuals' and a group's understanding and intent to take action on climate change, from a social psychological disciplinary perspective. Focusing on a reduced analysis of the free association tasks in a larger study, for this article, we aim to share insights on challenges of motivating TSSOs to take action on climate change.

Research Design

This case study investigates a UNESCO Biosphere Reserve (BR) in sub-tropical Noosa, Queensland, one of 14 BRs in Australia (UNESCO 2015). Its governing body, (at the time of the research), referred to as the Noosa Biosphere Reserve (NBR) Board, comprised over 65 members, including the sector boards. It is charged with promoting sustainable use of the reserve's natural resources, conserving its biodiversity (Moller 2011) and advancing climate change education within its boundaries (UNESCO 2015). While the data was gathered in 2012, it is still highly applicable, as little has changed globally or in Australia in terms of actively addressing 21st century climate change or developing comprehensive adaptive strategies. Given a continued global lag in meaningful action, it makes it even more important to use TSSOs to supplement efforts of governments, the private sector and individuals.

The benefits of using the NBR Board as the case study TSSO derives from the wider applicability of research outcomes to Biosphere Reserves (BRs) worldwide and to other areas particularly vulnerable to climate change and its consequences (IPCC 2007). As of 2015, 669 globally-designated UNESCO BRs operated across 120 countries (UNESCO 2015). This extensive BR network has the potential to reach key stakeholders, such as scientists, policy-makers and local community activists, to achieve BR aims of promoting sustainability and educate the public about climate change and adaptive actions (UNESCO 1995, 1996, 2000, 2002, 2005, 2015). Sharing this knowledge across TSSO advocacy groups is important to the international goal of creating long-term sustainable adaptation. Individual and collective efforts across all segments of society (civil, private, and government) are necessary to achieve the level of adaptive actions required to meet the challenges presented by 21st century climate change. However, to date, the knowledge-sharing from BR activities and their potential community benefits tend to be limited (Reed et al. 2014; Reed and Massie 2013).

The NBR Board operates within a climate 'vulnerability hotspot' (Hennessy et al. 2007; IPCC 2007; McDonald et al. 2010), designed because of the patterns of development, land use, and population growth along its coastline. These conditions, coupled with projected climate change intensity, make the NBR particularly vulnerable to more intense storms, heatwaves, bushfires, and sea-level rise (Hennessy et al. 2007; McDonald et al. 2010).

Methods

To examine the group's social representations, the cognitive (knowledge) and affective (emotion) associations were collected from semi-structured interviews with 23 participants. As part of a larger research project into understanding the group's social representations and social identity, this number of participants was sufficient for comprehensive in-depth qualitative research (Saunders et al. 2018; Bowen 2008).

We used free association tasks in the first part of the interview to determine participants' cognitive and emotive associations with climate change. The question 'What, if any, word or words came to mind when you hear the term climate change?' Each participant could provide up to four responses. The second question followed, 'What, if any, emotions come to mind when you hear the term climate change?' Again, each participant could provide up to four responses. Each participant was asked to suggest four words associated with climate change. The participant recruitment, data-generation techniques and data analysis were conducted under our university's ethical standards to provide anonymity.

Bypassing computer-generated coding, we used a personal, hands-on approach for coding and analysis of knowledge and emotion associations using Excel, enabling the researcher to work more closely with the data (Baxter and Jack 2008). This study codes free associations as first-order and subsequent-order associations to delve deeper into the initial understandings of climate change – a process used by other researchers (e.g. Smith and Joffe 2012; Moloney et al. 2012). The first thematic analysis identified knowledge association themes; the second free association analysis revealed the range of emotions generated from the term climate change.

Emotions effect social action (Lorenzoni et al. 2007; Smith and Leiserowitz 2014) and emotive associations can reveal 'the kind of narrative that is not structured according to conscious logic, but according to unconscious logic … defined by emotional motivations, rather than rational intentions' (Hollway and Jefferson 2008: 309). Seeking emotive associations, specifically, provides additional and nuanced knowledge about effect (Hollway and Jefferson 2008). Considering the positive or negative emotions provides additional context regarding a group's relationship to the research object, perhaps with the potential for active consequences (Hoijer 2010).

Findings

The results revealed that understanding of climate change causes and impacts were consistent with current scientific knowledge. Potential responses to climate change (e.g. adaptive action), though, were narrowly defined and accompanied with negative emotional connotations.

From the 23 participants, 72 knowledge associations with climate change were elicited. All 23 participants offered at least one knowledge association with climate change; 15 participants provided four associations. The first-order associations were tabulated separately from a compilation of the second-to-fourth-order associations (Smith and Joffe 2012). Where appropriate, for preservation of distinctive patterns, associations were homogenised, with semantically similar words, plurals, and singular words categorised under the most frequently occurring association (Moloney et al. 2012).

Analysis of the themes arising from the knowledge associations reveal three distinct categories: cause, impacts, and response to climate change. Nearly all of the 72 knowledge associations lie within this framework. First-order associations are equally distributed showing a plurality of associations with cause, closely followed by impacts and response (Table 1). However, the findings of the subsequent-order associations show a majority of knowledge associations with impacts, while less than half comprise response and cause combined.

Table 1. Knowledge associations with climate change cause, impacts and responses

Theme	First-order*	Subsequent-order*	Total*
Cause of climate change	7 (32%)	9 (18%)	16 (22%)
Impacts of climate change	6 (27%)	28 (56%)	34 (47%)
Responses to climate change	6 (27%)	13 (26%)	19 (27%)
Other	3 (14%)	0 (0%)	3 (4%)
Total	22 (100%)	50 (100%)	72 (100%)

*Note: Percentages in parentheses are indicators of word association emphasis given to each category and are for reflective purposes rather than statistical significance.

Knowledge theme 1: causes of climate change

Most participants accept human activities as a contributing factor to 21st century climate change (Table 2), as illustrated within three subthemes: anthropogenic intervention, natural processes, or an anthropogenic/natural combined causality. The majority of associations relate to human intervention, reported as 'the influence of man's intervention', 'reactions caused by humans', 'processes caused by human activity', and 'result of non-sustainable practices'. One association, 'anthropogenic-enhanced variability', indicates the joint effect of human-induced contributions coupled with the inherent natural variability of the Earth's climate. Two associations focused exclusively on the climate's 'variability', which describes the collective natural physical activities that, in any one period, provide variations in the weather over time.

Table 2. First-order knowledge associations with cause of climate change

Anthropogenic	Anthropogenic/Natural	Natural
"Reactions caused by humans" "Man's intervention" "Result of non-sustainable practices" "Processes caused by human activity"	"Anthropogenic-enhanced variability"	"Climate variability" (2)
Total (4)	Total (1)	Total (2)

Seven of the participants who offered subsequent-order knowledge associations within the cause of climate change refer to specific anthropogenic activities such as "polluted Asian cities" or "fossil fuel burning", while another two attribute cause to natural processes over millennium, "ice ages" and "solar radiation" (Table 3).

Table 3. Subsequent-order knowledge associations with cause of climate change

Anthropogenic	Natural
Pollution (4) ["pollution"; "polluted Asian cities"; "pollution"; "fossil fuel burning"] Other (3) ["growth in urban areas"; "unstainable behaviours"; "generated by people who deny"]	"Ice ages" "Solar radiation"
Total (7)	Total (2)

Knowledge theme 2: impact of climate change

A majority of participants identify impacts from climate change as concrete concepts. Most of the first-order impacts are consequences of a physical change that could occur within the NBR, a proximal impact where the severity and occurrences have a direct effect on the participants' lives and livelihoods and the health of their community or their geographic distance from it (Table 4). In contrast, the one reference to 'melting ice' presents an image geographically distant from the participants, sub-tropical residents.

Table 4. First-order knowledge associations with impacts of climate change

Proximal impacts	Distal impacts
Change in weather (2) Environmental change (2) Heat (1)	Melting ice
Total (5)	Total (1)

Participants who chose to provide subsequent-order knowledge associations offered 28 impact-related associations (Table 5). Twenty associations reflect proximal impacts that relate to the NBR, with over half of those lying within the subthemes of sea-level rise, heat and flooding. Other proximal impacts offered by more than one participant include storms, fires, or changing weather. Eight associations relate to distal physical

events; the majority relating to ice melts; others included the iconic image of a 'polar bear on an iceberg', 'salt lakes in the Murray' (i.e. Australia's Murray-Darling Basin), and 'Sandy' (i.e. Hurricane Sandy in the USA in October 2012, reported widely in the Australian press during the data collection period).

Table 5. Subsequent-order knowledge associations with impacts of climate change

Proximal impacts	Distal impacts
Sea-level rise (5) Heat (4) [including "global warming"; "globe on fire"; "temperature gauge rising"] Flooding (3) [including "changes in water levels"] Extreme weather (2) [including "volatile weather patterns"] Storms/cyclones (2) Fires (2) "Disasters" "Polluted under-ground water"	Melting ice (5) "Polar bear on iceberg" "Hurricane Sandy" "Salt lakes in Murray"
Total (20)	Total (8)

Knowledge theme 3: responses to climate change

The first-order knowledge associations aligning with the response to climate change are evenly split between two subthemes: environmental or socio-political actions (Table 6). The environmental responses mostly address non-specific broad actions of sustainability. Most of the socio-political actions focus on political barriers or challenges that indicate a collective political response outside of individual self-efficacy: 'biggest political challenge', 'political arguments', and 'political agenda'. No first-order associations directly relate to specific actions.

Table 6. First-order knowledge associations with response to climate change

Environmental	Socio-political
"Sustainability" (2) "Good environmental decisions"	"Biggest political challenge" "Political arguments" "Political agenda"
Total (3)	Total (3)

Subsequent-order knowledge associations also align with environmental or socio-political responses to climate change sub-themes (Table 7). All environmental actions focus on climate change responses to mitigate greenhouse gas concentrations or adapt to climate change impacts. The majority of responses address mitigation, such as 'energy efficiency', 'solar and wind energy', and 'clean tech', with two associations providing adaptive responses.

The subsequent order socio-political responses to climate change were less cohesive. Responses focused on responsibility by someone else, either political (e.g. 'political frustration' and 'climate sceptics') or scientific, (e.g. 'realm of scientists'). More action-oriented responses address the need for enhanced communication, (e.g. 'education and awareness-raising') and behavioural change (e.g. 'important to change habits'), which could be undertaken collectively or by individuals.

Table 7. Subsequent-order knowledge associations with response to climate change

Environmental	Socio-political
Mitigation (5) [including "energy efficiency"; "clean tech"; "solar and wind energy"] Adaptation (2) [including "wet-season sandbags"]	"Political frustration" "Climate sceptics" "Dead-end road" "Education and awareness-raising" "Important to change habits" "Realm of scientists"
Total (7)	Total (6)

Emotive associations

Emotions, instinctive or intuitive feelings, distinct from knowledge, contribute to an individual's relationship with a research object or phenomenon (Robinson 2009). Affect, as used in psychology, encompasses experiences of feelings or emotions (Hogg et al. 2010). Therefore, considering affect as positive or negative feelings is an important aspect of an individual's interaction with a research object, such as climate change. The emotion association task explored participants' emotional connection with climate change through a typology of negative, mixed or positive emotions, considering the emotion through its affect valence, the intrinsic attraction (positive valence) or aversion (negative valence) associated with a research object (Frijda 1986).

From the interview data, 36 emotive associations were recorded. All but one participant, when asked to provide an emotion associated with the term climate change, offered at least one association, while nine added another 14. An analysis of the emotive associations, categorised by negative, mixed or positive affect, suggests a predominantly negative relationship to climate change (Table 8). Over three-quarters of the emotive associations align with negative feelings. No participant expressed positive associations as a first elicitation; in subsequent-order associations, positive associations appeared about one-third of the time.

Table 8. Affect from emotive associations with climate change

Affect	First-order	Subsequent-order	Total
Negative	20	9	28
Mixed	2	0	2
Positive	0	5	6
Total	22	14	36

Nearly all of the initial associations demonstrated negative feelings about the term climate change (Table 9). The majority of negative emotions were passive, (e.g. 'cynical', 'sadness', and 'resignation'); several were active (e.g. frustration, fear and blame). Two associations, 'ambivalence' and 'confused' show contradictory feelings about climate change. No positive emotions were offered as first-order associations.

Table 9. Affect from first-order emotive associations with climate change

Negative affect		Mixed affect	
Anger		Ambivalence	
Blame		Confused	
Concern	(5)		
Cynical			
Disappointment			
Fear			
Frustration	(3)		
Futility			
Pessimism			
Resignation			
Sadness	(2)		
Worry	(2)		
Total	(20)	Total	(2)

Nine participants offered subsequent-order emotions associated with climate change, two-thirds of which expressed negative mainly passive feelings (Table 10). One-third of the subsequent-order associations were positive emotions such as 'hope' or 'compassion'.

Table 10. Affect from subsequent-order emotive associations with climate change

Negative affect		Positive affect	
Blame		Compassion	
Concern		Excitement	
Fear		Hope	(2)
Frustration		Positive feelings	
Resignation			
Pessimism			
Sadness	(3)		
Total	(9)	Total	(5)

The second part of the emotive analysis is based on a framework to categorise emotions by their associations (Robinson 2009). The emotive associations in this study align with Robinson's event-related, future appraisal, or an object's properties categories (Table 11). Robinson (2009) further categorised emotions across three criteria used in cognitive experiences: a strong motivating subjective quality (i.e. pain or pleasure); a response to an event or object; or a motivator to behaviour. Motivating behaviours of future appraisals align with the emotions' affect (Robinson 2009).

In this study, few emotive associations reveal emotions with positive affect (e.g. hope) that would suggest positive motivation. A number of negative event-related emotions (e.g. blame, concern, frustration and disappointment) arise from the perceived resistance to the fulfilment of individual will.

Discussion

The knowledge association task reveals NBR Board participants' initial thoughts and emotions around climate change, with knowledge themes identified around causes,

Table 11. Type of emotions and affect from emotive associations with climate change

Type of emotion	Emotions with positive affect	Emotion with negative affect
Phenomenon or event-related	Excitement Positive feelings	Anger Blame (2) Concern (6) Disappointment Frustration (4) Pessimism (2) Sadness (5) Worry (2)
Future Appraisal	Hope (2)	Fear (2)
Related to object or phenomenon's properties	Compassion	Cynical Futility Resignation (2)

impacts and responses, reflecting a framing by participants that align with key aspects of the phenomenon currently under negotiation within the scientific communities. The emotions association task shows primarily negative emotions associated with climate change.

The three knowledge themes align with research areas of the IPCC working groups: Working Group I (IPCC 2013) addresses climate science and components of causality; Working Group II (IPCC 2014a) examines climate change impacts and adaptation; and Working Group III (IPCC, 2014b) assesses mitigation responses to reduce the human-induced activities at the heart of 21st century climate change.

Knowledge of causes

The public has become exposed to the established scientific views on climate change, but this information is often filtered through the media. While established science informs us that multiple natural and anthropogenic causal factors for 21st century climate change exist, the media promotes a high level of disagreement about the cause of climate change. Today, the media continues to present a polarity between a natural occurrence and a constructed crisis, whereby solutions to climate change causality will either incur an unnecessary economic cost to address an uncertain or unsolvable problem or rectify a human-induced catastrophe. The word associations in this study relating to the cause of 21st century climate change reveal this dialectical opposition between human intervention and the natural variability of the climate system, with the balance towards human-induced activities.

Nearly all associations within the theme of causality are reflective of the work of the IPCC and other climate science research, which details the numerous natural processes attributable to the Earth's climate (IPCC 2013). Only one participant offered a hybrid association, specifically noting both anthropogenic and natural processes, 'anthropogenic-enhanced variability', which indicates a broader spontaneous response. This one association reflects the conclusion of the IPCC (2013): that 21st century climate change is a combination of

natural forcings coupled with anthropogenic activities globally.

Knowledge of impacts

The participants' knowledge associations about impacts regarding ice melting or polar bears on ice sheets were gleaned mainly through media representations. These findings are consistent with other climate research (e.g., Hoijer 2010; O'Neill and Nicholson-Cole 2009). An important finding is that no social or economic impacts were elicited. The scientific data of the IPCC (2014a) note specific social impacts such as heat stroke, particularly in the elderly and the spread of vector borne diseases; economic impacts cut across all sectors from agriculture to tourism to transportation.

Emotive associations

Participants' emotive associations suggest a personal connection with climate change with primarily negative emotions and affect. A majority of negative emotions associated with the phenomenon itself were passive (e.g. frustration) with few emotions relating to the future appraisal of climate change (e.g. hope or fear). These emotive associations ran counter to the enthusiasm and positive affect that the NBR Board participants revealed in discussions of their sustainability community projects revealed in another part of this study. The literature on emotions and their effects on motivation and engagement with climate change is a growing area of research but suggests that negative emotions can have both a negative and positive influence on action, and that media and leadership play an important role.

On the one hand, research into negative connotations of climate change indicates it promotes denial (Norgaard 2011). As media often portrays global climate change as causing widespread and potentially catastrophic impacts, negative impressions are prevalent across societies; therefore, collective climate denial is found across cultures (e.g., Lorenzoni et al. 2007; Norgaard 2011). Research into climate denial suggests an avoidance to acknowledge disturbing information or to avoid negative emotions such as fear, guilt or helplessness; it does not indicate a lack of or rejection of scientific knowledge or lack of concern for the environment or future generations (Norgaard 2011). Collective climate denial may be tempered in some groups through their social environment, which can strongly influence the way an individual uses climate change information (Yang and Kohlor 2012).

On the other hand, insights into emotions demonstrate that a negative affect does not necessarily preclude actions to address climate change and in a TSSO, such as the NBR Board, where the social environment produces a shared social identity, the predominantly negative emotions in this study may induce information-seeking (Yang and Kahlor 2012). Experiential factors that include discrete emotions and affect can play a critical role in processing risk information (Finucane 2008; Finucane et al. 2000). In addition, some studies show that negative emotions, such as 'worry' are the single strongest predictor to indicate support for national climate and energy policies in the United States (Leiserowitz 2006). Others suggest that to instil responsive actions, negative emotions must be coupled with positive connections to climate change (O'Neill and Nicholson-Cole 2009).

Promoting efforts to encourage positive emotions around climate responses may be more effective than public appeals using fear or guilt. Sjoberg (2007) argued that while risks are perceived as threatening, options to mitigate the threat yielded optimism, satisfaction and interest and were strong predictors of attitudes toward risks across a variety of phenomenon including nuclear waste repositories, radiation and mad cow disease. Hoijer (2010) found that hope and compassion were emotions that motivated people to learn more about the hazards of climate change impacts and to consider adaptation measures. Smith and Leiserowitz (2014) found that positive emotions, such as hope, excitement, and interest, are important to support climate action.

Community groups are not isolated entities only reflecting ideas within their group. External pressures such as elected leadership can influence the extent to which a TSSO advocates for action. This goes hand in hand with media representations of climate change which greatly influence knowledge as well as emotions (Carvalho and Burgess 2005; Hoijer 2010), particularly when they saturate the community with incomprehensible yet dangerous phenomena (O'Neill and Nicholson-Cole 2009). Many institutional organisations often choose to present the narratives around climate change in a 'dramatic' sense, highlighting negative consequences or worst-case scenarios (Trumbo and Shanahan 2000; O'Neill & Nicholson-Cole 2009). While fear-inducing representations can act initially as an attention-grabbing device, sustained exposure to negative narratives about climate change can act as barriers to actions (Lorenzoni et al. 2007). Research suggests that negative emotions such as fear may be counter-productive if the goal is to motivate the public to address climate change.

To summarise, the analysis of free associations of words relating to knowledge and emotions from the NBR Board's participants reveals initial unconscious aspects about causality, effects and responses to climate change. The unconscious negative emotions associated with climate change may be a barrier to action unless accompanied by positive direct proposals for intervention.

Conclusion

In this study, the free associations revealed lay knowledge and emotions that provide insights into the participants' social construction of climate change. While the primarily negative emotive associations show the group's concern over the climate phenomenon, the knowledge associations revealed heterogeneous understanding of climate change with the impressions of its causality and actions well beyond the scope of the group's local mandate.

Emotive associations demonstrate personal connections that can be leveraged to address social action, with 'sadness' and 'concern', indicating that participants share an emotional connection to the phenomenon. The socio-political knowledge associations were often negative, which may indicate that the participants view responses to climate change as outside their control.

Analysis of the participants' knowledge and emotive associations creates a starting point from which to further explore community engagement with climate adaptation by leveraging social networks to advance adaptive action. It highlights the need for consistent leadership on climate change action across all levels of government.

This study demonstrates that applying the free association task to reveal knowledge and emotive impressions of climate change to a TSSO provides one effective means of revealing the understanding and motivation of its membership. Given their networks, TSSOs operating within biosphere reserves can be a valuable vehicle for community engagement in action on climate change. However, if TSSO members have associations with climate change that are too narrow in scope or are primarily negative emotional connections, then motivations to undertake local action may be limited. Community practitioners may find a process, such as a free association task, helpful to understand cognitive and emotional connections to climate change, as a starting point for community engagement, especially where a local Council has declared a climate emergency.

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