THE RELATIONSHIP BETWEEN ENVIRONMENTAL WORLDVIEWS, EMOTIONS AND PERSONAL EFFICACY IN CLIMATE CHANGE

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This study investigates the effects of a video on the Australian viewers' environmental worldviews, their emotions and personal efficacy in climate change. Confirmatory factor analysis and structural equation modelling were employed to test the associations between the constructs. The main theoretical contribution relates to the mediating role of emotions in climate change communication. Results further show that the video increased viewers' perception that they can influence climate change outcomes, as well as encourage others to reduce the effects of climate change. Findings suggest that effective climate change communication has to target people's emotions. Policy should be directed to climate change communication tools with a focus on emotional engagement to encourage people to take personal responsibility in climate change and act, catalysing the desired behavioural change.

Keywords: Climate change, Environmental worldviews, Emotions, Personal efficacy

Introduction

Climate change is emerging as a major challenge for societies and economies (Higham & Cohen, 2011; Ter Mors et al., 2010). As climate change impacts are being increasingly felt around the globe, unsustainable lifestyle patterns and behaviours have called for pressing attention (Gifford, 2008). Engaging the public in climate change communication is a key objective of policy makers and non-governmental organisations (Scannell & Gifford, 2013). The general public perception being no longer only affected by scientific and technical descriptions (Beattie, 2011) calls for more effective communication about impacts and actions needed to curb the effects of climate change (Corbett & Durfee, 2004; Nisbet & Mooney, 2007). This will further encourage and promote sustainable behaviour (Spence & Pidgeon, 2012; Stern, 2000).

Engaging the general public is particularly challenging since climate change is often not perceived to have immediate and personally relevant impacts (Gifford, 2008; Vlek, 2000). Public communication however continues to be central in assessing public responsibility in addressing the complex environmental issue of climate change (Carvalho, 2009; Hansen, 2011). While environment-focussed communication research has become firmly established over the past two decades, it has evolved and diversified in a number of ways (Hansen, 2009). Participatory visual techniques (e.g., videos, DVDs) have known a rapid growth in international research and practice (Shaw et al., 2009; Sherren et al., 2010) as a tool for climate change communication. Such techniques have valuable applications for communicating local messages, improving awareness, and engaging different groups in society to further the climate change debate (Petheram, Stacey, Campbell & High, 2012).

Climate change needs a thoughtful approach to communication to achieve full engagement of the public. The aim of the present study is to investigate how environmental worldviews predict personal efficacy in climate change actions after viewers have watched a video on climate change. A change of behaviour to achieve the desired transition in climate change actions is vital. Among the multiple barriers for changing behaviours, one major challenge is that lifestyle patterns tend to be deeply embedded in worldviews (Hernes, 2012; Shove et al., 2012). For the purpose of this study, environmental worldviews can be defined as a more or less internally consistent set of values that profoundly inform our understanding of the environment (Hedlund de Witt, 2013) and its particular relevance to the context of climate change. Environmental worldviews can profoundly inform people's understanding and perception (Hedlund de Witt, 2012) of climate change and their willingness to engage in solutions to address the issue both individually and socially (Gifford, 2011).

Some evidence suggests that environmental worldviews can be a determinant of people's emotions, which can in turn lead to a shift in behaviour. Interventions to change behaviour however, require not only a deep understanding of how to encourage climate change actions but also a deep focus on how emotions can strengthen environmental beliefs and acceptance of personal responsibility for climate change. Although existing research suggests climate change communication is a potentially useful concept to influence human behaviour, few studies have explored environmental worldviews, viewers' emotions and their personal efficacy in one integrative model. Such change involves how individuals' environmental worldviews can act as important drivers of emotions (Landmann, 1996) and influence personal efficacy (Kempton, Boster, & Hartley, 1995). Given that climate change results may be highly influenced by worldviews (Harth et al., 2013), and emotions (Kaiser et al., 2008), the association between these constructs requires further investigation (Hulme, 2009; O'Brien, 2009) to bring the desired societal change (Buenstoff & Cordes, 2008).

Structural equation modelling (SEM) is employed using an Australian nationally representative online panel of 751 respondents. The theoretical constructs of interest in this study are presented in Figure 1. The current study aims to contribute to the body of literature in (1) exploring the associations between worldviews, emotions and personal efficacy in climate change engagement, and (2) gauging the effectiveness of climate change communication visuals in generating appropriate responses at personal levels that will help mitigate the impacts of climate change
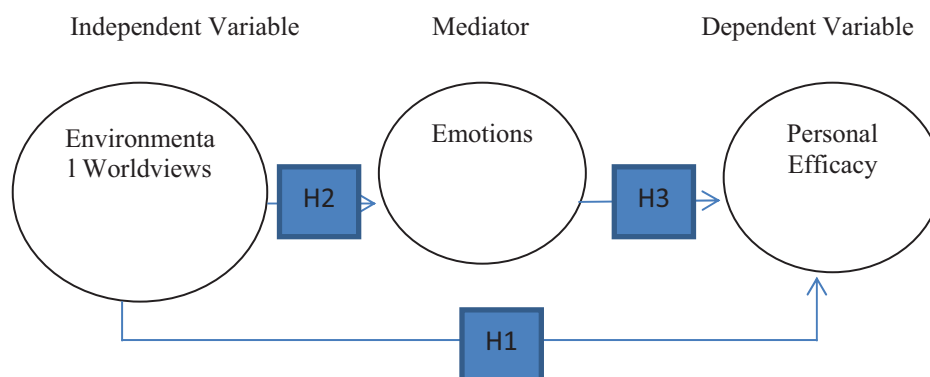
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Figure 1: Conceptual model.

Literature Review

Climate change communication

Factual knowledge regarding climate change is important when citizens form their intentions to behave in a pro-environmental manner (Sundblad et al., 2009). Environmental communication is important in imparting such knowledge (Artl et al., 2011) which in turn can influence attitudes of viewers and show various possibilities of action (Lance et al., 2003; Stamm et al., 2001). A number of studies have shown that public perception and attitudes can be significantly influenced by visual DVDs and other means of communication (Corbett and Durfee, 2004; Krosnick et al., 2000). However, other research suggests that while awareness about climate change seems to be high, understanding and behavioural engagement is far lower (Whitmarsh, Seyfang & O'Neill, 2011). People's attitudes to climate change tend to be heterogeneous (Upham et al., 2009) which partly appears to relate to the interpretational nature of sources (Whitmarsh, 2009). Yet the risk literature, and studies on persuasion and learning from social psychology literature demonstrates that the same information may be processed differently according to prior knowledge, cognitive abilities, values, accepted worldviews and social and institutional factors (e.g., Petty & Cacioppo, 1986).

Environmental Worldviews

To address the climate change debate, it is critical to understand how humans are influenced by environmental worldviews and whether it leads to a shift of behaviour which can make a relevant change. Cultural and environmental theorists recognise worldviews as important drivers of behaviour in public understanding of climate change (e.g., Poortinga & Pidgeon, 2004; Stern, 2002; Whitmarsh, 2011). Environmental worldviews tend to influence decisions and engage people to think about potential solutions for addressing the issue (Gifford, 2011). Researchers argue that choosing and framing messages that are consistent with people's environmental worldviews are effective ways to achieve recommended behaviours (Maibach, Roser-Renouf & Leiserowitz, 2008; Stern, 2002). Most individuals are keen to accept and establish a connection with those portrayals where the "truth claims" about climate change are embedded in their worldviews, judgements and preferences (Carvalho, 2009). Those with strong individualistic worldviews, not perceiving climate change as a threat, are less receptive to media visuals (Maibach et al., 2008).

Environmental Worldviews and Personal Efficacy

Environmental worldviews that are held by individuals or shared within cultures can provide a basis for promoting personal efficacy in climate change (Ockwell et al., 2009). Personal efficacy is defined as an individual's judgement of his/her capability to execute a particular behaviour (Chen, Chuang, Chen, 2012). This is well in line with Frey & Jeggen's (2000) motivation crowding theory which encourages intrinsic motivation to act out of concern (e.g., for climate change). People feel concerned and experience personal efficacy to solve environmental issues they are well informed of (Milfont, 2012). It is important to recognise that lack of knowledge can act as a barrier preventing people to change their behaviour. Often however, people fail to behave in their own or the society's best interest as a result of not having the relevant information (Maibach et al., 2008).

Environmental worldviews often help people shape their attitudes towards climate change (Weber & Stern, 2011) and further motivate constructive engagement in personal actions (such as personal efficacy) (Bulkeley, 2000; Frumkin et al., 2008). This is the affective dimension of attitudes as evidenced by Schwartz (1977). Further, individuals with shared worldviews may exert a powerful influence on their willingness to address the issue of climate change societally (Gifford, 2011). People often are willing to make more efforts when they perceive their contribution can help alleviate the crisis (Vugt, 2009). High levels of information about human ecological impacts are shown to predict higher degrees of personal efficacy (Kellstedt, Zahran, & Vedlitz, 2008). This corroborates with the knowledge-deficit approach where appropriate information is disseminated with the expectation that it will lead to increased awareness and lead to corrective actions (Owens, 2000) in alleviating impacts of climate change. Those with strong pro-environmental worldviews however may not be persuaded by information on climate change that appeared controversial to them (Corbett & Durfee, 2004). The same information may be processed differently determined by individual differences in values, beliefs, and abilities (Whitmarsh, 2011).

These behaviours often require constant efforts and persistence (Bandura, 1997). Frey & Stutzer (2006) recognise climate change communication as an important tool for people to learn and acknowledge personal responsibilities. Ockwell et al. (2009) however emphasise the need for smarter communication strategies in climate change mitigation. They argue that there is lack of personal efficacy in action on climate change. Numerous people feel their efforts are wasted as "nobody is living up to their side of the bargain" (Bibbings, 2004, pp. 103). A study in Britain showed only a little more than half of the surveyed population believe their actions would actually reduce the impact on climate change (BBC, 2004). Remarkably more research is warranted for a more inclusive understanding of how environmental worldviews may be an important determinant of personal efficacy, influencing people to take personal responsibility for their actions and engage in efforts to contribute to reduce effects of climate change. Hence, the following hypothesis is proposed.

Hypothesis 1: Environmental worldviews have a positive influence on people's personal efficacy on concern for climate change.

Environmental Worldviews and Emotions

The role of emotions has been an inspiration for several studies in cognitive psychology and consumer research (Olney, Holbrook, & Batra, 1991; Stewart & Mormsand, 2007) but however, received limited attention in behaviour change research (Morris, Woo, & Singh, 2005). The growing recognition of the climate change impacts has called for an investigation of the role of environmental worldviews to transit to a more ecological society (Witt, 2012). If the goal is to communicate climate change messages through visuals, simply stating scientific facts and figures are not likely to have a big influence on the audience (Beattie, 2011; Leiserowitz, 2006). Choices about climate change actions appeal to individuals' environmental values and their emotions (Stern, 2012). The emotive quality of a message can provoke affective responses and in turn promote a change in behaviour (Spence & Pidgeon, 2010; Stern, 2012), e.g., support for climate change policy. According to Milton (2002), the things people value in the world give rise to emotions without which there would be no value. Climate change visuals trigger instant reflexes and feelings engaging people's emotions (Sheppard, 2005) and help them remember the designed messages (Bartels & Nelissen, 2000). Visuals may also increase their empathy with

other people making them more open to consider different perspectives in decision-making (Petheram et al., 2012).

The above review suggests that visuals are powerful tools engaging people emotionally, and may influence their behaviour (Slovic et al., 2002) in climate change actions. To date however, few studies have investigated the association between individuals' environmental worldviews and their emotions on concern for climate change. To bridge this gap in literature, hypothesis 2 is proposed.

Hypothesis 2: Environmental worldviews have a positive influence on viewers' emotions on concern for climate change.

Mediating Role of Emotions

While past research sought to understand the association between environmental worldviews and emotions, studies investigating the mediating effect of viewers' emotions on the relationship between viewers' environmental worldviews and their personal efficacy on concern for climate change are sparse in literature. A mediator is an intervening variable which is affected by an independent variable(s) and in turn affects the dependent variable(s) (Kline, 1998). In the present study, viewers' emotions may act as a mediator between their environmental worldviews and personal efficacy constructs. This implies emotions may be one of the key mechanisms by which environmental worldviews are linked to viewers' personal efficacy on concern for climate change. The affective component, along with the cognitive and behavioural aspects (Lorenzoni, 2007) plays a significant role in climate change communication. Often, viewers make connections between the presented information and what they already know and feel about the topic (e.g., low carbon emissions, actions needed for a clean future). Images can trigger powerful emotional responses (Daniel & Meitner, 2001; Oring, 1999). Content processing gives rise to emotions which may have a lasting effect on attitude change (Morris et al., 2005).

Climate change messages may be more effective when they are consistent with fundamental environmental worldviews (Stern, 2012) and appeal to emotions (Spence & Pidgeon, 2010) which in turn may lead to personal efficacy and courses of actions in climate change mitigation (National Endowment for Science and Technology, Association, NETSA, 2008). For example, Witte & Allen (2000) note that the greater the level of fear produced by a communication, the greater was the influence on the attitude change although the lack of immediacy of climate change as a threat makes using fear difficult. Hence, it might be possible to generate positive emotions in individuals through visuals with messages which are embedded in their environmental worldviews, which in turn may lead to acceptance of personal responsibility for climate change effects. Individuals may feel obliged to act both individually and socially (Gifford, 2011) promoting the desired change in behaviour. To the authors' knowledge, studies investigating the mediating role of emotions between people's environmental worldviews and their personal efficacy on concern for climate change are sparse in literature. Hence, hypothesis 3 is proposed.

Hypothesis 3: Viewers' emotions mediate the relationship between viewers' environmental worldviews and their personal efficacy on concern for climate change.

Methodology

The Empower public video is a 15-min film designed to engage the public about low carbon emissions, a clean energy future and climate change action. The aim of the present study was to analyse the associations between peoples' environmental worldviews, emotions and their personal efficacy in an attempt to shed more light on the climate change debate. Data for this study was collected by Lightspeed Australia online panel between July and August 2012. A nationally representative quota sample of 751 respondents completed the online questionnaire with no missing data. The online survey ensured an easy delivery mechanism for the video averaging 27 minutes to complete the questionnaire including viewing with a response rate of 70%. No incentives were provided for participation. The gender split of the sample was 51% female and 49% male with approximately two-third of the sample being home owners and about 33% renting. The age distribution was 12% (18-24 years), 29% (25-39 years), 29% (40-54 years) and 30% (55 years and older). Around 35% had completed secondary education, and 31% had a university degree.

Scale Measurements

The survey instrument was developed based on an extensive review of the environmental psychology, sociology and communication literature. Questions examined a range of constructs ranging from climate change communication with constructs environmental worldviews, emotions, and personal efficacy in climate change. The shortened version of the NEP scale adopted from Whitmarsh (2011) was used to measure environmental worldviews on a 1-10 Likert scale including statements "humans are severely abusing the planet", "plants and animals have the same rights as humans to exist", "nature is strong enough to cope with the impact of modern industrial nations", "humans were meant to rule over nature", "the balance of nature is very delicate and easily upset" (1=disagree; 10=agree). Respondents were asked to report on their emotions using a 1-7 Likert four-item scale: "watching this video was not enjoyable-watching this video was enjoyable, "the video was not entertaining-the video was entertaining", "the video was not interesting-the video was interesting" and "the video was not satisfying-the video was satisfying". Personal efficacy was measured using 3 items borrowed from literature (e.g., Kellstedt et al., 2008) estimating how a respondent (1) perceives he/she can influence climate change outcomes; (2) encourages others to reduce effects of climate change; and (3) accepts that human beings are responsible for climate change.

Modelling Process

Structural Equation Modelling (SEM) was used to test the proposed structural model using AMOS (V. 20). AMOS is one of the most commonly used SEM software applications (Nachtigall, Kroehne, Funke, & Steyer, 2003) used to determine the overall fit of the measurement and structural models using the maximum likelihood method of estimation (Anderson & Gerbing, 1988). Chi-square was employed as the first fit index but due to it being sensitive to sample size (Byrne, 2001), other fit indices were necessary. The root mean square error of approximation (RMSEA), goodness of fit index (GFI, Joreskog & Sorbom, 1989), comparative fit index (CFI, Bentler, 1990), normed fit index (NFI, Bentler, & Bonnett, 1980), incremental fit index (IFI, Hu, & Bentler, 1995), parsimonious goodness of fit index (PGFI, Mulaik et al., 1989) and parsimonious normed fit index (PNFI, Mulaik et al., 1989) were

included in the study. Values for GFI, CFI, NFI, PGFI and PNFI range from 0 to 1, with values closer to 1.00 indicating a good model fit (Bryne, 1989; Hair, Black, Babin, & Anderson, 2010; Mulaik et al., 1989). Confirmatory factor analysis was employed to produce empirical evidence of construct validity. The overall measurement model with constructs of viewers' environmental worldviews, emotions, and personal efficacy was tested. This resulted in the deletion of 2 items on the environmental worldviews construct due to low factor loadings (nature is strong enough to cope with the impact of modern industrial nations; humans were meant to rule over nature). The measurement model was respecified, and the overall fit was then evaluated using the fit indices. Composite reliability and variance extracted were used to further evaluate the reliability and validity of the overall measurement model.

Results

The first stage was to test the measurement model which had acceptable model fit indices: Chi-square = 134.5 (p = 0.00); GFI = 0.97; CFI = 0.98; PGFI = 0.56; PNFI = 0.69; IFI = 0.98; NFI = 0.97; and RMSEA = 0.06. This indicates that the model fits the data fairly well (Hair et al., 2010).

Table 1 Psychometric properties of the confirmatory factor model.

Constructs and Scale items	Factor loadings	Composite reliability	Variance extracted
Personal efficacy		.88	.84
PE1 I perceive I can influence climate change outcomes	.91		
PE2 I encourage others to reduce effects of climate change	.72		
PE3 I accept that human beings are responsible for climate change	.88		
		70	.66
Worldviews	.69		
WW1 Humans are severely abusing the planet	.57		
WW2 Plants and animals have the same rights as humans to exist	.72		
WW5 The balance of nature is very delicate and easily upset			
		.93	.87

Emotions	
EMO1 Enjoyable	.89
EMO2 Entertaining	.81
EMO3 Interesting	.88
EMO4 Satisfying	.90

The measurement model was further validated for its reliability and validity. Composite reliability and average variance extracted were used as reliability measures. As indicated in Table 1, the composite reliability scores for all the constructs ranged from 0.70 to 0.93 exceeding the recommended level of 0.70, indicating that internal consistency was achieved for all indicators (Hatcher, 1994). Construct validity is the extent to which indicators of a construct measure what they are supposed to measure (Bagozzi & Yi, 2012). Convergent validity was assessed from the measurement model by determining whether each indicator's estimated pattern coefficient on its posited underlying construct factor was significant (Marsh & Grayson, 1995). All factor loadings for items retained as shown in Table 1 were greater than 0.5 and were statistically significant ($p < 0.001$). This indicates the proposed indicators capture well the constructs that they were hypothesised to measure indicating convergent validity (Cabrera-Nyugen, 2010).

An additional test of discriminant validity was conducted. Results show that the variance extracted for each of the constructs was greater than the squared correlations between the construct and other constructs in the model (Fornell & Larckner, 1981). For instance, the average variance extracted for personal efficacy was .84 while the shared variance between personal efficacy and other constructs ranged from .58 to .69. These results confirm that the constructs are distinct from one another. Discriminant validity results are presented in Table 2.

Table 2 Discriminant validity matrix.

	Environmental Worldviews	Emotions	Personal Efficacy
Environmental Worldviews	.66	.42	.58
Emotions		.87	.69
Personal Efficacy			.84

After ensuring that the overall measurement model was valid and acceptable, the theoretically postulated structural relations between the latent variables were tested. The structural equation model proposes that (1) environmental worldviews has a positive influence on people's personal efficacy; (2) environmental worldviews has a positive influence on viewers' emotions; (3) viewers' emotions mediates the relationship between environmental worldviews

and personal efficacy in climate change. The structural model with standardized path coefficients is presented in Figure 2. The model fit indicated that it was acceptable: Chi-square = 134.4 (p = 0.00); GFI = 0.97; CFI = 0.97; PGFI = 0.56 PNFI = 0.69; IFI = 0.98 and RMSEA = 0.06 (Hair et al., 2010). The OMM and SEM model fit indices are shown in Table 3.

Table 3 Model fit indices.

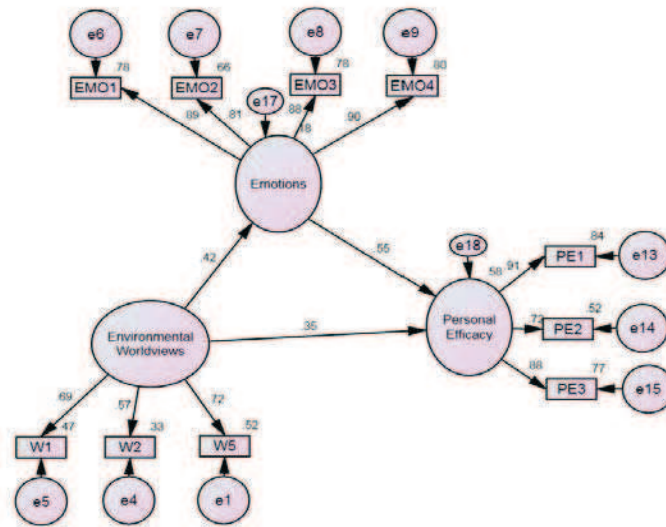| Model	Chi-Square	RMSEA	GFI	CFI	IFI	PGFI	PNFI
OMM	134.5 (p=0.00)	0.06	.97	.98	.98	.56	.69
SEM	134.4 (p=0.00)	0.06	.97	.97	.98	.56	.69

Figure 2: Structural model.

Table 4 Regression paths.

Hypothesis	Regression paths coefficients	Standard path	Critical ratio (t-value)	p	Results
H1	Environmental Worldviews → Perceived efficacy	0.35	8.29	***	Supported
H2	Environmental Worldviews → Emotions	0.42	8.89	***	Supported
H3	Emotions → Perceived efficacy	0.55	15.26	***	Supported

Discussion and Implications

This study explored the direct effects of environmental worldviews on people's emotions and their personal efficacy and the mediating effect of emotions in climate change communication. Findings confirm the significance of these constructs in the present study. Hypothesis 1 predicts that there is a positive relationship between viewers' environmental worldviews and their personal efficacy in climate change. Findings are consistent with literature in that people's judgements are often influenced by environmental worldviews (e.g., Slovic, 1987; Vugt, 2009) which in turn influence their likelihood and obligation to act (e.g., Dietz et al., 2007, Stern et al., 1999). The strong effect of viewers' personal efficacy suggest that environmental worldviews hence evoke concern for climate change (Weber & Stern, 2011) shaping individuals' attitudes and their obligation to act individually and socially (Gifford, 2011). This finding however, is incongruent with Hargreaves, Lewis & Speers (2003) and Hinchliffe (1996) results reporting that the public tend not to associate causes of climate change with personal actions and do not accept personal responsibility. Individuals tend to conform and accept those messages which are closely reflected in their own worldviews and judgement (Nicholson-Cole, 2005) suggesting that those perceiving climate change as an abstract concept, distant in time and space may fail to realise how their personal efforts might really have an effect on climate change mitigation. The lack of conclusive evidence demands more investigation on people's sense of personal efficacy about concerns for climate change. Policy makers may need to consider what causes individuals to feel personally concerned for climate change while others may not accept responsibility for the problem. This is fundamentally important when developing climate change communication visuals (such as the short video in the present study) to stimulate behaviour change since climate change messages may also lead to heterogeneous interpretations from the public.

Hypothesis 2 investigated the relationship between environmental worldviews held by viewers and their emotions after watching the video. The present study indicates that viewers' worldviews was a significant determinant of their emotions ($t = 8.89$, $p < 0.00$; $\beta = 0.42$). This finding converges with other studies in literature (e.g., Maibach et al., 2008; Nisbet, 2009). This suggests that government officials and campaign strategists trying to communicate climate change may need to optimize on the emotive quality of visuals (e.g., concrete and vivid images) and further align those with the target audience environmental worldviews. This is fundamentally important since people feel concerned and experience positive emotions consistent with their environmental worldviews (Harth et al., 2013; Kaiser et al., 2008) triggering pro-environmental actions (Stern, 2012) (e.g. support for climate change policies). The emotive messages (e.g. rising sea level clips) may further help to build on the psychological effects triggering a change in behaviour among the viewers (Beattie, 2011).

Hypothesis 3 predicts that viewers' emotions mediate the relationship between their environmental worldviews and their personal efficacy on concern for climate change. Results support the hypothesis indicating emotions as a significant mediator in this relationship. This may be explained by the fact that viewers' emotions may be shaped by their environmental values, developing or reinforcing a sense of personal concern for the environment. Probably viewers with positive emotions have stronger environmental values and are more predisposed to accept personal responsibility out of concern for the environment (Dietz et al., 2007). Further, they may feel obligated to act (Stern, 2012) adopting climate change mitigation practices for the good of the environment. This suggests that policy makers should emphasize the emotive aspects focussing on images that give rise to emotions consistent with viewers' environmental

worldviews when designing climate change communication visuals. This might result in more effective public understanding of the climate change impacts leading to behavioural change.

Conclusion

This paper explores climate change communication visuals in influencing viewers' responsibility and their motivation to act in climate change mitigation. This research demonstrates firstly that environmental worldviews have important implications for shaping individuals' personal efficacy in climate change. It further emphasises the mediating role of emotive aspects in climate change messages to catalyse behaviour change. Further, it has called into question findings of several other studies indicating public reluctance in taking personal responsibility and intentions to engage in personal efforts to mitigate the effects of climate change.

An interesting finding is that the public accepts humans are responsible for climate change, posing a risk to their well-being and recognise that their personal actions can help in solving the problem. When crafting messages on climate change, policy makers will need to first ensure the climate change messages reflect the target audience's environmental worldviews to successfully engage the public. Further, given that personal efficacy in the climate change domain is affected by affective processes, policy makers should place increasing emphasis on providing substantial visual climate change information focussing on emotive images to attract and hold people's attention and motivate them to act. Strategies to promote affective components in climate change communication could include message development and delivery aimed at arousing positive emotions which may bring about meaningful interpretations and stimulate public's engagement in reducing the effects of climate change.

Notwithstanding its theoretical and practical contributions, this study has limitations which researchers should consider when evaluating its findings. Conducted in Australia, the generalisability of findings may be limited. Future researchers may consider conducting similar studies in other countries. Future studies can expand on the structural model by including other variables which may predict personal efficacy (Nilsson et al., 2004) which may improve the predictive power of the model. Future researchers could build on the findings to build effectively on immediate psychological effects induced by climate change visuals. This will help to achieve public engagement and bridge the gap between information campaigning and personal actions on climate change. This will guide the design and adoption of viable solutions and ensure continued effectiveness of behaviour change polices in climate change mitigation. The communication challenge often lies in activating concern about climate change and catalysing the desired behaviour change. Policy makers, social scientists and non-governmental organisations should work in close collaboration to improve the public's understanding of climate change impacts and alleviate the climate change crisis.

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