

# Conceptualising pro-environmental behaviour and the experiences of anthropogenic environmental degradation

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There is growing recognition of the psychological effects of the experience of anthropogenic environmental degradation. Pro-environmental behaviour (PEB) can be an adaptive response and may be influenced by value orientations and psychological processes. Using a mixed-methods approach, quantitative data from 205 New Zealand adults was collected to determine how well value orientations and stress appraisals of anthropogenic environmental degradation predict PEB. Results showed biospheric values and primary appraisals predicted greater engagement in PEB. Qualitative data from 269 New Zealand adults showed that experiences of anthropogenic environmental degradation are multi-dimensional and reflected five themes: depressive emotions; anxious emotions; dissatisfaction and outrage; impact on behaviour and functioning; and hope. The generalisability of the findings is limited given our samples (predominantly female, Pākeha and young) do not reflect the diversity of the wider New Zealand population. Relevance of findings are discussed in promoting wellbeing of individuals and communities whilst maximising mitigation strategies.

**Key words:** *Anthropogenic Environmental Degradation, Psychological Effects, Adaptive Behavioural Response, Pro-environmental Behaviour, Biospheric Values, Climate Change and Mental Health*

## INTRODUCTION

Anthropogenic environmental degradation (the depletion of the earth's natural resources due to human interference) is a major global issue, the consequences of which will potentially be substantial and irreversible, affecting human safety, infrastructure, agriculture, economic systems, water supplies and natural ecosystems (Intergovernmental Panel on Climate Change, 2014; U.S. Global Change Research Program, 2017). In addition to the impact on natural and human systems, it is now also recognised that anthropogenic environmental degradation, including the effects of climate change, has and will continue to have psychological consequences for individuals and communities (Alyward et al., 2022; Berry et al., 2010; Doherty & Clayton, 2011; Fritze et al., 2008; Gifford & Gifford, 2016). Much of the current literature focuses on climate change however our current study adopts the use of the term *anthropogenic environmental degradation*. Human activity has had significant consequences for the environment, beyond purely the impacts on the earth's atmosphere (Lewis & Maslin, 2015). The term 'climate change' is therefore limited and anthropogenic environmental degradation includes the broad range of environmental changes caused by human activity.

The psychological consequences of directly experiencing the effects of anthropogenic environmental degradation are widely acknowledged. Extreme weather events and environmental stressors are known to contribute to the development of adverse psychiatric outcomes (Clayton, 2020; Galea et al., 2005; Marshall et al., 2007; van den Berg et al., 2005) and result in ongoing disruptions to the social, economic and environmental determinants of mental health (Berry et al., 2010; Clayton,

2021; Costello et al., 2009; Doherty & Clayton, 2011; Fritze et al., 2008; Norris et al., 2002; Page & Howard, 2010). There is now an increasing recognition of the psychological consequences due to the indirect experience of anthropogenic environmental degradation as a global environmental threat. These indirect impacts include emotional distress over the state of the environment caused by reading about and viewing images of environmental degradation or human suffering, and a related questioning of lifestyle decisions (Doherty & Clayton, 2011; Fritze et al., 2008). A wide range of emotions associated with environmental degradation include anxiety, worry, stress, guilt, grief, despair, anger and even optimism, hope and pride (Cunsolo & Ellis, 2018; Doherty & Clayton, 2011; Fritze et al., 2008; Gifford & Gifford, 2016; Harth et al., 2013; Kals & Russell, 2001; Kleres & Wettergren, 2017; Reese & Jacob, 2015; Reser & Swim, 2011; Searle & Gow, 2010; Verplanken & Roy, 2013; Weintrobe, 2013). Psychological responses to anthropogenic environmental degradation can be adaptive (Verplanken & Roy, 2012) and it is important to avoid pathologising valid reactions, especially considering the negative impact of stigma and labels in mental health (Ben-Zeev et al., 2010). There is ongoing debate about whether psychologists should even consider it as a mental health issue (e.g., Bhullar et al., 2022). However, the climate crisis has the potential to increase peoples' vulnerability to develop mental health issues (Thoma et al., 2021) and psychological responses to experiences such as climate change may lead to functional impairments and psychopathology (Doherty & Clayton, 2011; Clayton, 2020). The potential mental health impact on individuals and communities warrants empirical attention as we move further into the period

during which human activity has been the dominant influence on climate and the environment (the Anthropocene).

One notable adaptive response to anthropogenic environmental degradation is pro-environmental behaviour (PEB) (Doherty & Clayton, 2011; Maiteny, 2002), defined as '*behaviour that consciously seeks to minimize the negative impact of one's actions on the natural and built world*' (Kollmuss & Agyeman, 2002) and made up of actions by individuals, groups and governments (Adger et al., 2005). PEB not only benefits environmental wellbeing, but research has suggested that PEB may also improve individual wellbeing (Brown & Kasser, 2005; Jacob et al., 2009; Kaida & Kaida, 2016). Considering this, along with the documented psychological impact of anthropogenic environmental degradation, it may be advantageous to investigate how to best understand and promote PEB among individuals and communities.

Generally, PEB has been explained through two theoretical concepts. First, PEB has been suggested in previous studies to be a response to cognitive threat/risk appraisals of environmental problems or negative affect (fear, guilt etc.), possibly leading PEB to be a problem-focused coping strategy (Hartmann et al., 2014; Homburg & Stolberg, 2006; Ojala, 2013; Schmitt et al., 2018). Emotional responses can be thought of as a system, and the quality and intensity of emotion may depend on a variety of variables (personal and environmental) and mediating processes such as cognitive appraisal and coping (Lazarus & Folkman, 1987). The cognitive appraisal process involves primary appraisal (where the individual evaluates the encounter in terms of how threatening or challenging it may be) and secondary appraisal (where the individual assesses their available resources, options in response to the event and involves perceptions of control) (Lazarus & Folkman, 1984). Coping strategies (PEB in this instance) are responses to perceived distress after the cognitive appraisal process, and are effortful or purposeful thoughts and actions aimed to overcome or manage stressful situations (Lazarus & Folkman, 1984). Coping responses are often categorised as either emotion-focused or problem-focused and can have adaptive or maladaptive consequences (Baker & Berenbaum, 2007; Doherty & Clayton, 2011).

Secondly, values play a key role in influencing PEB, and egoistic, altruistic and biospheric values have been defined and studied in previous literature (Gatersleben et al., 2014; Helm et al., 2018; Stern et al., 1993; Schultz, 2001; Schultz et al., 2005; Stern et al., 1995). Egoistic values (or otherwise known as self-enhancement values) refer to power, achievement and hedonistic value types; altruistic values relate to social justice, world peace and equality; biospheric values concern the environment, protecting and respecting the earth, nature and other species (Stern et al., 1998). Values are suggested to influence PEB by influencing specific behavioural beliefs (otherwise known as environmental concerns), norms and intentions (De Groot & Steg, 2009). General value orientations can be measured and have been linked to PEB (Helm et al., 2018; Schultz, 2001) but a significant portion of past research has focused on the relationship between the value orientations underlying environmental concern

and PEB (Helm et al., 2018; Stern et al., 1993; Schultz, 2001; Schultz et al., 2005). Egoistic environmental concern suggests that PEB occurs when it aligns with self-interest and when expected benefits outweigh the costs. Altruistic environmental concern may influence an individual to engage in pro-environmental behaviour, only when the aim is to protect other human beings. Environmental concern based on a biospheric value orientation would cause individuals to act environmentally when species or habitat destruction is at stake (Stern et al., 1993). There is mixed evidence regarding how general value orientations correlate with value orientations underlying environmental concern (Stern et al., 1995; Schultz, 2001; Schultz et al., 2005), however, it is suggested that egoistic, altruistic and biospheric values can lead to egoistic, altruistic and biospheric environmental concerns respectively, under the right conditions (De Groot & Steg, 2009). Despite PEB being theoretically possible under all three value orientations, biospheric value orientation generally has emerged as the strongest predictor of PEB (Gatersleben et al., 2014; Helm et al., 2018; Schultz et al., 2005; Stern et al., 1995).

Finally, demographic factors may also impact pro-environmental behaviour with a number of studies suggesting that older age may predict higher pro-environmental engagement (Swami et al., 2011; Wiernik et al., 2013; Gifford & Nilsson, 2014).

Using a mixed-methods survey design, our current study first used a quantitative approach to investigate how well value orientations (egoistic, altruistic and biospheric) and cognitive stress appraisals of anthropogenic environmental degradation predict the engagement in PEB in a sample of adults in New Zealand. Considering the complexity of emotion and emotional responses to anthropogenic environmental degradation, we felt that this would not be effectively captured through purely quantitative methods. Therefore, using qualitative data collected alongside the quantitative data, our study also explored participants' experiences of anthropogenic environmental degradation and the psychological effects, providing a comprehensive conceptualisation of the emotions, thought processes, contextual influences, behaviours and functional implications that result from experiencing anthropogenic environmental degradation in New Zealanders.

## METHOD

This mixed methods study used a quantitative approach to examine how well value orientations and cognitive stress appraisals of anthropogenic environmental degradation predict the engagement in pro-environmental behaviour in a sample of adults in New Zealand. Thematic analysis was used to analyse qualitative survey data to explore the experiences of anthropogenic environmental degradation and the psychological impact in New Zealanders.

### Quantitative Study Methods

The recruitment process was conducted during June – July 2019. Advertisements, which included a URL link to an online survey, were placed on social media sites.

**Table 1.** Demographic information of sample (n=205)

Category	n (%)
<i>Gender</i>	
Male	23 (11.2)
Female	180 (87.8)
Non-binary/gender fluid	2 (.9)
<i>Ethnicity</i>	
NZ European/ Pākehā	152 (74.1)
Māori	14 (6.8)
Pacific Islander/ Pasifika	4 (2.0)
Asian	21 (10.2)
Other	14 (6.8)

Advertisements on Facebook were placed on community group pages (e.g. ‘Zero-Waste New Zealand’, ‘Auckland Vegans’ or university group pages). Advertisements were also voluntarily shared by some participants on their own personal social media. Participants were invited to click the link to the online survey if they were interested in participating in the research. After using the URL link, the participants were presented with an information sheet which allowed them to indicate their informed consent to participate in the study. Participants were then asked to fill out and submit the online survey. No identifying information was collected, and participants had full anonymity when completing the survey.

A total of 246 participants volunteered to complete the survey. The inclusion criteria required participants to be 18 years old or over and a New Zealand resident. Of the 246 participants, 205 completed the entire survey and therefore provided sufficient information to be used in the current study. The 41 surveys that had missing data were discarded. 180 participants identified as female, 23 as male and 2 participants identified as non-binary or gender fluid. Ages ranged from 18 to 75 and the mean age of the participants was 36 years (SD= 12.4). The distribution of age was moderately skewed with a skewness of .781 (SE= .17) and kurtosis of .338 (SE= .34). Participants came from a diverse range of ethnic backgrounds, including Māori, Pasifika and Asian. However, most of the participants (74.1%) identified as being New Zealand European (Pākehā). A summary of the demographic information of the participants are provided in Table 1.

This quantitative study utilised an online, self-report survey that was made available through Qualtrics software (2019, Qualtrics). Some of the terms used in the information sheet differed from the terms presented in this manuscript (e.g. “pro-environmental behaviour” and “anthropogenic environmental degradation” was changed to “environmentally-friendly behaviour” and “human-caused environmental destruction”). This was to avoid using academic jargon with participants and helped to make the research study understandable to lay-persons. The survey consisted of predominantly closed questions

and measured the study variables using the following quantitative instruments.

*Demographic information:* A series of questions were used to obtain demographic information about the participants. Information regarding the age, gender identity and ethnicity of participants was collected.

*Value orientation:* Value orientation was measured using a brief inventory of values (Stern et al., 1998) which measured Schwartz’s (1994) four value clusters of self-transcendence, self-enhancement (or egoistic), conservatism (or conservative) and openness to change. As the items in the self-transcendence cluster is weighted towards environmental content, Stern et al. (1998) separates these into biospheric (environmental) and altruistic (non-environmental) clusters. The use of five value clusters is recommended for environmental research where identifying biospheric values may be more appropriate (Stern et al., 1998). Five value subscales were therefore used to measure five value clusters using the 15-item inventory: altruistic (a world at peace, social justice and equality), biospheric (protecting the environment, unity with nature and respecting the earth), egoistic (authority, influence and wealth), conservative (honouring elders, family security and self-discipline) and openness to change (a varied life, an exciting life and curiosity). Each of these subscales consisted of 3 items and participants rated items “as a guiding principle in my life” on a nine-point importance scale from -1 (opposed to my values) to 0 (not important) to 7 (of supreme importance). Scores for each of the value clusters were calculated (the average of all 3 items from each cluster). Differences in response style were controlled for by calculating centred values scores, which was done by subtracting the mean value score (average of all 15 value items) from each of the scores of the five values clusters. It should be noted that since our study only concerned egoistic, altruistic and biospheric value orientations, only these were included in our analyses.

Reliability alpha scores from Stern et al. (1998) were sufficient, ranging from 0.85 – 0.62 (Table 2). Stern et al. (1998) note that the development of the brief scales sacrificed some reliability but did not result in any noticeable sacrifice of the predictive value. There was adequate validity for four value clusters: self-transcendence, conservative, self-enhancement and openness to change. The Self-transcendence is suggested to be broken into to two sub-scales, biospheric and altruistic, when research is interested in environmental attitudes and behaviours (Stern et al., 1998).

*Pro-environmental behaviour:* Participants were presented with a list of 14 pro-environmental behaviours or activities identified in a previous unpublished qualitative study (Ashwell, 2019). The definition used to identify pro-environmental behaviours was: ‘*behaviour that consciously seeks to minimize the negative impact of*

**Table 2.** Alpha reliability coefficients for value cluster subscales (Stern et al., 1998)

Subscale	Study 1	Study 2
Altruistic	.72	.65
Biospheric	.84	.84
Conservative	.64	.65
Egoistic (self-enhancement)	.70	.67
Openness to change	.77	.62

**Table 3.** Alpha reliability coefficients for subscales measuring appraisal dimension of the SAM (Peacock & Wong, 1990)

Subscale	Study 1	Study 2	Study 3
<i>Primary appraisal</i>			
Threat	.75	.73	.65
Challenge	.74	.79	.66
Centrality	.90	.85	.84
<i>Secondary appraisal</i>			
Controllable by self	.87	.86	.84
Controllable by others	.84	.84	.85
Uncontrollable by anyone	.51	.82	.57
Overall perceived stressfulness	.81	.75	.79

one's actions on the natural and built world (Kollmuss & Agyeman, 2002). Participants were asked to rate how often they had engaged in these behaviours in the past year, on a five-point Likert scale from 1 (never or almost never) to 5 (always or almost always). A total average score was generated by calculating the mean of all items.

*Stress appraisal of anthropogenic environmental degradation:* The stress appraisal measure (SAM) (Peacock & Wong, 1990) was used to measure the stress appraisals of anthropogenic environmental degradation. Because there is yet to be a validated, reliable measure of psychological distress related to anthropogenic environmental degradation, the SAM was used, as it is an established measure of stress appraisal dimensions regarding a chosen situation. The SAM is a 28-item scale used to measure an individual's appraisal of a specific stressful situation across three primary appraisal dimensions (threat, challenge, centrality) and three secondary appraisal dimensions (controllable-by-self, controllable-by-others, uncontrollable-by-anyone). An overall perceived stressfulness subscale is also included. Participants rated their responses to questions regarding their thoughts about various aspects of *the global situation regarding human-caused environmental destruction* (e.g. "is this a totally hopeless situation?") on a five-point Likert scale from 1 (not at all) to 5 (extremely). There is support for the psychometric properties of the scale with satisfactory internal consistency across the SAM scales (Table 3). Two factor analyses showed that the six appraisal dimensions were relatively independent and multiple regression analyses found that "threat" and "centrality" were significant predictors of overall stressfulness (Peacock & Wong, 1990). Mean scores were generated for each of the seven subscales.

The Statistical Package for the Social Sciences (SPSS v.25) was used to analyse the data, with statistical significance taken at  $p < 0.05$ . Data was exported from Qualtrics and imported into SPSS. The assumptions of normality were explored prior to each analysis and were met. The first analyses consisted of computing the descriptive statistics for the sample. Reliability analyses were conducted, and Cronbach's alpha coefficients and item-total correlations were generated for the scales and subscales used in the study. Cronbach's alpha were considered acceptable if they were greater than .70. Considering that Cronbach's alpha may not be ideal for scales that consist of less than 10 items, mean inter-item correlations were checked if alpha coefficients were

below .70. Briggs and Cheek (1986) recommend an optimal inter-item correlation range between .2 to .3. Item-total correlations were considered acceptable if they were over .30 (showing that items measure the same underlying construct) and under .80 (indicating the scale is not experiencing multicollinearity) (Briggs & Cheek, 1986). Pearson's product moment correlations and partial correlations (controlling for age and gender) were then used to examine correlations amongst value orientations, stress appraisal measures and pro-environmental behaviour and are provided in Table 4. Finally, hierarchical multiple regression analyses were utilised to test the extent to which value orientations and stress appraisal dimensions predicted pro-environmental behaviour.

### Qualitative Study Methods

An anonymous online survey was completed by participants made available through Qualtrics software (2019, Qualtrics) during August 2019 as described above. The survey utilised two open ended questions to collect qualitative data: 'What thoughts or feelings do you have around current global environmental issues?' and 'How have your thoughts or feelings around global environmental issues impacted your life?'. The questions aimed to understand the experiences of anthropogenic environmental degradation and the psychological effects. Responses were collated into a word document for analysis.

Recruitment advertisements were posted online as described above, and 269 participants volunteered to be included in the qualitative study. The inclusion criteria required participants to be over 18 years old and a New Zealand resident. Of the 269 participants 48.7% were aged 18-30, 24.2% were aged 31-40, 17.5% were aged 41-50, 8.2% were aged 51-60 and 1.5% were aged 60 years old or older. The ethnic composition of the sample population was 81.8% New Zealand European/ Pākehā, 7.8% Asian, 2.6% Māori and 7.8% other. In terms of gender, 67.7% identified as female, 31.2% identified as male and 0.1% identified as gender fluid/ non-binary.

The data was analysed using Braun and Clarke's (2006) thematic analysis. As the current study was conducted within a realist paradigm, the approach to the data was inductive. Codes and themes were developed from the data as the starting point. Data was primarily coded semantically, focusing on the explicit meanings at the surface level, however, latent coding was also used when

**Table 4.** Pearson's correlations between variables with partial correlations controlling for age and gender<sup>a</sup> to the right of the major diagonal.

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Altruistic	-	.06	-.10	-.46***	-.33***	.10	.06	-.09	.08	.03	-.04	-.14	.12
2. Biospheric	.06	-	-.41***	-.48***	-.16*	.56***	.28***	.31***	.41***	.29***	.15*	-.14*	.39***
3. Conservative	-.10	-.39***	-	-.10	-.32***	-.12	-.08	-.03	-.16*	-.03	.03	.18**	-.19**
4. Egoistic	-.45***	-.48***	-.10	-	-.18*	-.42***	-.28***	-.10	-.29**	-.13	-.02	.06	-.26***
5. Openness to change	-.34***	-.17*	-.33***	-.17*	-	-.07	.07	-.11	-.02	-.16	-.12	.03	-.03
6. Pro-environmental behaviour	.12	.56***	-.10	-.40***	-.13	-	.27***	.39***	.48***	.38***	.16*	-.04	.43***
7. Threat	.05	.24***	-.10	-.27***	.11	-.19**	-	-.06	.63***	.06	-.23**	.22**	.70***
8. Challenge	-.08	.30***	-.03	-.09	-.11	.38***	-.06	-	.28***	.62***	.41***	.17*	.30***
9. Centrality	.06	.38***	-.16*	-.28***	.03	.37***	.64***	.26***	-	.26***	-.07	-.01	.62***
10. Controllable-by-self	.02	.28***	-.04	-.13	-.12	.32***	.09	.61***	.28***	-	.54***	-.14	.38***
11. Controllable-by-others	-.05	.15*	.03	-.02	-.12	.16*	-.23**	.41***	-.07	.53***	-	-.18**	.02
12. Uncontrollable-by-anyone	-.13	-.12	.19**	.06	.00	-.01	.18**	-.17*	-.04	-.15*	-.18**	-	.21**
13. Overall stressfulness	.12	.36***	-.20**	-.25***	.01	.37**	.71***	.30***	.62***	.39***	.02	.18**	-

Note. Zero order correlations N= 205; Partial correlations N= 203; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ ; <sup>a</sup> Male= 1 Female= 2

**Table 5.** Hierarchical multiple regression model predicting pro-environmental behaviour from value orientations and dimensions of stress appraisals

Step and variable	R <sup>2</sup>	ΔR <sup>2</sup>	ΔF	B	β	T
Step 1	.08	.08	9.04***			
Age				.01	.27	4.04***
Gender				.15	.08	1.20
Step 2	.40	.32	35.07***			
Age				.01	.23	4.07***
Gender				.23	.12	2.24*
Altruistic				-.02	-.02	-.34
Biospheric				.27	.45	6.94***
Egoistic				-.11	-.20	-2.76**
Step 3	.51	.11	5.89***			
Age				.01	.30	5.33***
Gender				.24	.13	2.43*
Altruistic				-.01	-.02	-.31
Biospheric				.18	.29	4.36***
Egoistic				-.10	-.19	-2.76**
Threat				-.07	-.10	-1.05
Challenge				.09	.10	1.42
Centrality				.16	.24	3.11**
Controllable-by-self				.09	.11	1.37
Controllable-by-others				.01	.01	.17
Uncontrollable-by-anyone				.03	.05	.81
Overall perceived stressfulness				.07	.09	1.00

Note. N= 203; \*p<.05; \*\*p<.01; \*\*\*p<.001

appropriate. Inductive and semantic approaches to thematic analysis are most appropriate with a realist approach to research (Willig & Stainton-Rodgers, 2017). Latent coding is more interpretive but acceptable within realist research if it theorises motivation, experience and meaning in a straight-forward and unidirectional way in terms of individual psychology (Braun & Clarke, 2006). The data analysis process was guided by the six phases outlined by Braun and Clarke (2006). Familiarisation with the data first occurred followed by the generation of the initial codes. Codes were then clustered together in terms of similarities to form the initial themes. Themes were then tentatively named, reviewed and re-reviewed to form the final themes and sub-themes.

**ANALYSIS AND COMMENTARY**

**Quantitative Study: Predicting (PEB) and stress appraisal**

Utilising hierarchical multiple regression (controlling for age and gender), we examined the extent to which value orientations and dimensions of stress appraisal predict PEB (Table 5). The regression model depicted in step 3 explained the greatest variance in PEB (R<sup>2</sup>= .51, F(12, 190)= 16.40, p< .001). Age was shown to have the greatest predictive power, β= .30, p< .001, followed by biospheric value orientation, β= .29, p< .001, centrality appraisals, β= .24, p=.002, egoistic value orientation, β= .19, p= .006, and finally gender, β= .13, p= .02.

Consistent with previous findings (Swami et al., 2011; Wiernik et al., 2013; Gifford & Nilsson, 2014) age was shown to make the largest unique contribution when predicting pro-environmental behaviour, suggesting that older adults are more likely to engage in higher levels of pro-environmental behaviour. Royne et al (2011) found that young people are more concerned about the environment than older generations, and yet evidence

from 31 countries showed that at the individual level, older people are more likely to be environmentally active (Wang, Hao & Liu, 2021). A meta-analysis conducted by Wiernik et al (2013) found most relationships between age and pro-environmental behaviours were negligibly small, and while our findings show age is a relevant contributing factor to pro-environmental behaviour locally, this is based on a relatively small percentage of older adults in our sample (8.2% age 51-60 and 1.5% aged 60 or older). It should also be noted that the current study did not control for other variables such as education level and social economic status, potentially impacting on the relationship between age and pro-environmental behaviour.

Our findings suggest the importance of value orientation in predicting PEB. Biospheric value orientation was the greatest non-demographic predictor of increased engagement in PEB. Out of all value orientations, the strongest predictor of PEB in previous research has consistently been biospheric value orientation or self-transcendence value orientation (the combination of biospheric and altruistic values) (Gatersleben et al., 2014; Helm et al., 2018; Schultz et al., 2005; Stern et al., 1995) and our findings also provide some supporting evidence. One explanation for this may be that PEB is often associated with societal and environmental benefits which are congruent with biospheric and altruistic values (De Groot & Steg, 2009). Value-oriented action has also been discussed in Acceptance and Commitment Therapy (ACT) research as a pathway towards overall wellbeing and psychological flexibility (Harris, 2006; Hayes et al., 2006). Considering that the psychological effects of anthropogenic environmental degradation are often negative or maladaptive, it could be hypothesised that PEB as value-oriented behaviour may buffer individual wellbeing, providing further incentive for engagement.

Our current study did not find evidence to support altruistic value orientation as a predictor of PEB and egoistic value orientation was found to predict lower engagement in PEB. Though it has been suggested that altruistic and egoistic values may lead to PEB through altruistic and egoistic environmental concerns (Helm et al., 2018; Schultz, 2001; Schultz et al., 2005; Stern et al., 1993), our findings do not support this relationship. It could be suggested that PEB and environmental wellbeing may not yet be viewed (at least within our sample) as important factors in promoting societal benefits and altruistic values. Costs of PEB may outweigh the personal benefits of engagement and perhaps the seriousness of local environmental problems has not yet reached a magnitude at which PEB aligns with egoistic values (De Groot & Steg, 2009; Schultz et al., 2005). It could also be further suggested that because the environment is viewed as an object external to one's self, worries about the environment may inherently be worries about the broader context (rather than one's self) (Schultz et al., 2005).

Out of all the measures of stress appraisal, centrality appraisal (of anthropogenic environmental degradation) was the only significant predictor of PEB. Centrality is conceptualised as a dimension of primary appraisal and encapsulates the perceptions of importance of a given situation on wellbeing and how much an individual has at stake (Peacock & Wong, 1990). As the current study measured specific dimensions of stress appraisal, it is difficult to compare our findings with those of previous studies, which all use different measures of stress appraisal or threat (Helm et al., 2018; Homburg & Stolberg, 2006; Schmitt et al., 2018). Furthermore, there have been mixed findings in the literature with some studies suggesting that perceived ecological stress does not predict PEB (Helm et al., 2018) and others which indicate that primary stress appraisal and collective-efficacy measures predict PEB (Homburg & Stolberg, 2006). Homburg and Stolberg (2006) found that primary appraisal measures of environmental problems (in the form of health threat and health harm appraisals) predicted PEB through problem-focused coping. The primary appraisal measures used by Homburg and Stolberg (2006) concern the consequences on health, which may align with the measure of centrality appraisal used in this study. Our measure of threat appraisal, however, did not specifically measure threat to health, which may explain why threat appraisal was not a significant predictor of PEB in our current study. Overall, this could suggest that the aspects of primary appraisals of anthropogenic environmental degradation that concern the impact on health and wellbeing may be of most importance in explaining PEB. Interestingly, Homburg and Stolberg (2006) found that their secondary appraisal measure of self-efficacy was not a significant predictor of PEB. Our study included a similar secondary appraisal measure, controllable-by-self, which was also found not to be a significant predictor. Homburg and Stolberg's (2006) study, however, did find that collective efficacy resulted in PEB, though our study found that secondary appraisal measures involving the collective (controllable-by-others and uncontrollable-by-anyone appraisal measures) were not significant predictors of PEB. Homburg and Stolberg's (2006) use of self and collective efficacy most

likely differ from our secondary appraisal measures which may reflect perceived controllability rather than efficacy, explaining the disparity in our findings. Although controllability and efficacy are correlated, they are distinguishable. Controllability relates to the belief that coping behaviours are up to the individual and involve an external locus of control. Efficacy relates to the perceived ease or difficulty of engaging in this behaviour and involve an internal locus of control (Ajzen, 2002). The measures used for secondary appraisal in our study have no correlation or a weak correlation with an internal locus of control, which support the notion that we may be measuring controllability rather than efficacy (Peacock & Wong, 1990). PEB therefore may be influenced by perceptions of the ease of collectively addressing anthropogenic environmental degradation, rather than perceptions of controllability.

### ***Qualitative Study: Experiences of anthropogenic environmental degradation and psychological effects***

Using thematic analysis, we analysed qualitative data from an online survey of adult New Zealanders to explore the experiences of anthropogenic environmental degradation and the psychological impact. Five general themes emerged from the data along with their corresponding subthemes (Table 6). Together, these themes captured the range of experiences of anthropogenic environmental degradation expressed by the participants and the complex multi-dimensionality of the various psychological outcomes.

A wide range of negative emotional responses were identified and included depressive emotions (sadness, despair, helplessness, hopelessness and guilt), anxious emotions (fear, anxiousness, worry, nervousness) and emotions as a result of dissatisfaction and outrage (anger, frustration, disappointment and annoyance). This was consistent with previous research noting the broad range of emotional and psychological experiences as a consequence of indirectly experiencing anthropogenic environmental degradation (Cunsolo & Ellis, 2018; Doherty & Clayton, 2011; Fritze et al., 2008; Gifford & Gifford, 2016; Harth et al., 2013; Kals & Russell, 2001; Kleres & Wettergren, 2017; Reese & Jacob, 2015; Reser & Swim, 2011; Searle & Gow, 2010; Verplanken & Roy, 2013; Weintrobe, 2013). Though hope was expressed by some of the participants, the vast majority of responses held a negative sentiment.

Depressive emotional responses from participants were found to fall into three subthemes: sadness and despair, helplessness and hopelessness, and guilt. From our participants' experiences, feelings of sadness and despair stemmed from current environmental losses and the failure of preventative actions. Experiences of hopelessness and helplessness were described to be a reaction to the severity of environmental damage and loss which was perceived as irreversible. Some participants also felt guilt due to the awareness that they were passing down a damaged environment to future generations. Anxious responses such as nervousness and fear were reported by participants in terms of anxiety for the future, subsequent consequences. One participant described difficulties around deciding to have children due to

**Table 6.** Identified themes and subthemes in the experiences of anthropogenic environmental degradation with supporting quotations from participants.

Theme	Subtheme	Participant quote
<b>Depressive emotional responses</b>	Sadness and despair	Despair at harm and loss of species, habitats and failure to act by those who could.
	Helplessness and hopelessness	You can feel helpless on an individual level- you can only do what you can do. Big changes need to come from the top- governments mainly. If they enforce changes and create laws around change, then that is the only way I can see the world surviving. Despite the care and effort put in by everyday people the situation seems somewhat hopeless. Perhaps the damage has already been done and it's too late to rectify it.
	Guilt	Extreme guilt when I cannot avoid plastic waste in my everyday modern life. It's depressing. I feel bad for my children and their future children inheriting an earth that has been totalled.
<b>Anxious emotional responses</b>	Anxiety for future	It makes me extremely nervous and scared that the earth may become so hot that it can do longer sustain human life. I'm finding it difficult to make a decision around having a child due to the situation.
	Anxiety in anticipation of inadequate action	I think myself and others generally feel a sense of malaise, anxiety and despair often about the large-scale changes that need to be made that we have limited control over. People deciding our destiny who are close minded. I have recently dramatically cut down my clothing purchases but feel anxiety that I can't do enough by myself
<b>Dissatisfaction and outrage</b>	With individuals	I think people still throw their rubbish in the wrong bin, people don't seem to care they only seem concerned about themselves in the here and now.
	With governments and corporations	Anger. I feel angry that people in power don't seem to be doing enough or that some don't seem to care at all. Feeling like it is out of my control - globally corporations and those in power don't seem to want to effect change and as an individual I can only do so much.
	With inaccurate information	My biggest concern is the overwhelming amount of fake news and inaccurate information being spread online particularly through social media. The most important step in overcoming climate change is through truthful facts and science and educate the masses. Myth, conspiracies, lies, false information, people being brainwashed, uneducated people, people lacking basic logic. It does not exist.
<b>Coping and functioning</b>	Active coping	I've reduced the amount of plastic waste I produce, we compost most of our food waste and eat as little meat as possible. We are choosing products more consciously and we will walk or bus more when we can. I've considered quitting [university] and trying to enjoy life as much as I can until shit hits the fan. Why go for long term goals anymore if the end of the world as we know it is almost assured?
	Avoidant coping	I try not to think about the future of our world very much because it stresses me, and I don't think there is anything I can do to change it, so I just put it out of my mind.
	Potential impact on mental health and wellbeing	Environmental anxiety conspires with my depression to tell me that I am a useless waste of resources and have no right to pollute the world with my existence. It is on my mind 24/7. I try very hard in everyday life to reduce my waste and care for the environment
<b>Hope</b>	Awareness of positive action	It's sad to see so many people not knowing how to take care of the environment and not recycling well, but also good to see that some people do that, and they are teaching that at school too.
	Hope for the future	So, while I have faith that we are smart enough to fix these problems, it will probably take a catastrophe to wake people up.

anxieties around the potential state of the environment in including anticipated environmental losses and their the future. Participants felt anxiety in response to perceived inadequate action, due to the belief that inaction from governments and corporations or individuals (including themselves) would not be enough to prevent future losses.

A consistent meta-theme across both depressive and anxious emotional responses was the awareness of ecological loss and destruction, and it could be further suggested that these depressive and anxious experiences may be a form of ecological grief. Ecological grief is a natural human response to loss and can include the

internal physiological and emotional responses associated with ecological loss (Cunsolo & Ellis, 2018). Similar findings have been noted in previous research such as Cunsolo and Ellis' (2018) three pathways to ecological grief through physical ecological losses, losses of environmental knowledge and through anticipated future losses. In addition, emotional responses regarding inaction around engagement in PEBs or decisions such as whether or not to have children, could suggest that ecological grief may also extend to the grief related to the loss of the ability to freely make lifestyle and personal choices due to daunting consideration of the future environment.

'Dissatisfaction and outrage' was identified as another theme of responses from participants. These were directed towards individuals, governments and corporations, and towards the spread of perceived inaccurate information. Participants expressed anger, frustration, disappointment and annoyance in response to a perceived lack of care and action from individuals, governments and corporations. They also stated concerns around the spread of inaccurate information (e.g. myths or conspiracy theories) through individuals or media outlets. That these responses were often expressed as anger or frustration could indicate participants' appraisals of injustice and perceived moral violations (Harth et al., 2013; Kals & Russell, 2001; Reese & Jacob, 2015).

Within the themes of depressive emotions, anxious emotions and dissatisfaction and outrage, there was a sense of a lack of perceived controllability around anthropogenic environmental degradation. Participants conveyed that positive environmental change was not up to individuals but in the hands of external influences such as governments and corporations. This has also been described in previous research as 'climate change helplessness', the belief that climate change is beyond personal control (Salomon et al., 2017). Helplessness, hopelessness, anxiety in anticipation of inadequate action and emotions related to dissatisfaction with governments and corporations (such as anger and frustration), despite their influence on environmental degradation, were expressed. Our findings are congruent with previous literature acknowledging perceived behavioural control as a determinant in emotional health. Perceived behavioural control has been negatively associated with trait and disorder-specific measures of anxiety (Gallagher et al., 2014) and depression (Brown & Siegel, 1988). Placing environmental responsibility on the government has been associated with greater efficacy and manageability of environmental issues (Davydova et al., 2018). Our findings, however, suggest that despite attributing environmental responsibility on to governments and corporations, perceived lack of care and action by these entities lead to a range of negative emotional responses rather than efficacy or manageability. A lack of trust or faith in governments and people in power (to engage in environmental action) may explain why our findings differ. Past research has indicated the importance of institutional trust and the ability of governments to provide a trustworthy environment and deliver honest and efficient services are essential components for individual wellbeing (Helliwell & Huang, 2008; Hudson, 2006).

Responses to anthropogenic environmental degradation were stated by participants to lead to a range of coping responses and functioning outcomes. Lifestyle adjustments such as PEBs were expressed as an active coping response, supporting previous literature suggesting PEB as a problem-focused coping response to anthropogenic environmental degradation (Harth et al., 2013; Hartmann et al., 2014; Homburg & Stolberg, 2006; Ojala, 2013). When individuals have lower traits of learned helplessness, environmental concern may be more likely to predict PEB (Landry et al., 2018). Consequently, emotional responses that arise from a sense of helplessness may not necessarily lead to positive environmental action. Emotion focused and avoidant coping strategies may even contribute to a lack of pro-environmental action. Previous literature has acknowledged denial as a response to anthropogenic environmental degradation (Doherty & Clayton, 2011; Kaida & Kaida, 2016). Avoidance strategies may interfere with appropriate action, and mental efforts to keep threatening material out of awareness may be costly in the long term (Roth & Cohen, 1986). While there were some responses in our study indicating denial regarding anthropogenic environmental degradation, we cannot determine whether these reactions are a product of psychological defences or rather different opinions or world views.

Mental health impacts of anthropogenic environmental degradation were explicitly discussed by some participants and their experiences were stated to exacerbate existing mental health conditions. These experiences support the findings of Searle and Gow (2010) who found that concern around climate change had a positive relationship with symptoms indicative of depression, anxiety and stress. As with Searle and Gow's (2010) study, the direction of causality cannot be established in our current study, as those with existing mental health conditions may be prone to viewing anthropogenic environmental degradation through a negative bias. However, regardless of the direction of causality, this still presents as a concerning issue for individual and community mental health. Though emotional distress in response to anthropogenic environmental degradation is rational and natural (Cunsolo & Ellis, 2018; Verplanken & Roy, 2013), the current study highlighted many aspects of the participants' experiences that were related to adverse psychological and emotional outcomes. Effects on daily functioning were noted as participants experienced overwhelming and reoccurring thoughts or considered significant, life-altering changes (such as the complete abandonment of long-term goals) in response to anthropogenic environmental degradation. This raises the issue around determining the point where rational and natural emotional responses become aversive to individual, community and environmental wellbeing.

### **CONCLUSIONS AND IMPLICATIONS**

This was the first study (to current knowledge) to consider the role of both general value orientations and stress appraisals of environmental degradation in predicting PEB. Additionally, this was also the first study to include separate measures of each dimension of stress

appraisal, allowing for more in-depth exploration of the functions of specific components of stress appraisal. Nonetheless, findings need to be considered in light of various limitations. Most importantly, it should be noted that the sample was not representative of the New Zealand population, with most participants identifying as female and New Zealand European, and nearly half aged 18-30. This limits the transferability and generalisability of the findings. Similarly, participants were recruited through social media sites, which may explain the higher proportion of younger age groups as well as raise some problems relating to self-report biases. Future research could overcome these problems by identifying relevant organisations or community groups and inviting a random selection of members to participate.

Future observational research could also aim to elucidate whether denial regarding anthropogenic environmental degradation is a product of psychological defences or differing world views and the impacts of anthropogenic environmental degradation on mental health outcomes. An experimental study may also be useful to understand the true effects of value orientations and cognitive stress appraisals of anthropogenic environmental degradation on PEB. For example, participants could be randomised to an intervention that promotes and/or induces either biospheric values or primary appraisals and, consequently, self-report their attempts of PEBs. Developing clinically relevant interventions to address the negative impact of anthropogenic environmental degradation would also be beneficial.

Our findings may have implications for public policy and the promotion of anthropogenic environmental degradation mitigatory behaviours. We suggest that encouraging PEB as action guided by individuals' biospheric values rather than altruistic or egoistic values, may promote greater engagement in PEB. Specific components of the primary appraisal process (such as centrality appraisals, concerning the impact on health and wellbeing) were shown to predict PEB in our study. This could suggest that strategies that inform individuals of the health and wellbeing impacts of anthropogenic environmental degradation may also help promote PEB.

There are also implications for mental health professionals, especially those working with individuals who have negative emotional experiences related to anthropogenic environmental degradation. Firstly, we suggest that PEB may be a form of value-oriented action for individuals who have biospheric-oriented values. Value-oriented behaviour is an important component in contemporary psychological therapies such as Acceptance and Commitment therapy (ACT) which can foster wellbeing and psychological flexibility through the encouragement of meaningful living (Harris, 2006; Hayes et al., 2006). It is possible that ACT may be an appropriate therapeutic approach when engaging with clients that present with distress over anthropogenic environmental degradation. However, more research is needed to explore the applicability of ACT for these clients.

Secondly, as PEB was demonstrated to be predicted by centrality appraisals in our study, this suggests that PEB may be used as a possible problem-focused coping

strategy. Problem-focused coping can be especially useful when individuals have high levels of emotional awareness, and is associated with higher positive affect. Individuals who are emotionally aware have adequate information about their goals and can effectively make decisions to solve their problems (Brown & Kasser, 2005). Similarly, PEB may also be associated with various positive coping attitudes including perceiving the problem as a shared responsibility and having favorable attitudes towards seeking assistance. Consequently, these may help to reduce perceptions of learned helplessness and improve self-efficacy. Though we have not determined how helpful PEB may be as a coping strategy itself, this possible function of PEB could be considered when seeing clients with environment-related distress. Having said that, psychologists need to be careful not to individualise the responsibility for efforts to mitigate the effects of anthropogenic environmental degradation.

Our qualitative findings demonstrate that participants were aware of the urgent need for not only individuals, but also larger entities such as governments and corporations, to take action. The range of negative emotional responses expressed by participants suggested an interconnection between their own distress and their recognition of a lack of care and action by people in power. Psychological responses to ecological losses, perceived inaction of self and others, and perceived uncontrollability of environmental outcomes were all present amongst the negative emotional responses of our participants. These highlight potential areas and levels of intervention when addressing the negative psychological impact and functional outcomes of anthropogenic environmental degradation and include not only individual behaviour change but, crucially pro-environmental policies and actions by people in power. Addressing these concerns will promote the wellbeing of individuals and communities, and ultimately contribute to the health of our planet.

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