

**Feeling and sacrifice:**

**How eco-emotions inform decisions to live with less to protect the natural environment**

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## Abstract

The rapid degradation of the environment is one of our greatest challenges in the 21<sup>st</sup> century. To avoid the worst consequences human behavior must change. The current study investigated how feelings about environmental problems (eco-emotions) predict concern for the natural environment and willingness to make sacrifices for it. Using a cross-sectional online sample of 286 New Zealand residents, latent profile analysis identified three profile groups with distinct patterns of eco-emotions: emotionally detached (40%), emotionally ambivalent (34%), and empathic alarmed (26%). Validation analyses revealed that members of the empathic-alarmed segment reported significantly higher levels of environmental concern and willingness to make sacrifices for the environment than members of the emotionally-ambivalent segment, who in turn expressed greater concern and willingness to sacrifice than members of the emotionally-detached segment. Findings from this study suggest that inducing a combination of negative eco-emotions with compassion may be effective for promoting environmental concern and pro-environmental sacrifice.

*Keywords:* eco-emotions, climate change, environmental problems, behavior change, pro-environmental behavior, environmental concern, willingness to sacrifice, audience segmentation

## Introduction

Emotions play an important role in shaping attitudes, threat appraisals, and decision-making processes, including those related to environmental issues such as climate change and sustainability. To avoid significant and potentially irreversible disruptions to the natural environment and human societies, we must learn to live within planetary boundaries: the limits within which humanity can safely operate to maintain a stable and resilient earth system (1, 2). Recent research, however, indicates that we have already exceeded safe limits of six of nine boundaries identified by Rockström and colleagues (1): climate change, novel entities, biogeochemical flows, land-system change, freshwater use, and biosphere integrity (1-4). Historical trends are also not encouraging. Early in the 1970s, humanity's annual demand for biological resources only marginally exceeded the amount the Earth ecosystem could regenerate. By 2022 this demand exceeded the ecosystem regeneration capacity by at least 70%. Reversing this trend constitutes one of humanity's greatest challenges. In the current study, we explore how feelings about environmental problems (eco-emotions) predict concern for the natural environment and willingness to make sacrifices to save it.

## Eco-emotions

In response to the growing number and intensity of environmental challenges, researchers in environmental psychology and behavioral economics have become increasingly interested in situational and personal factors that influence pro-environmental behavior (PEB; 5, 6, 7). The well-established link between emotions and behavior in other domains (8-13) has prompted environmental researchers to explore the relevance of emotional responses to PEB. Eco-emotions are broadly defined as conscious and unconscious feelings towards environmental problems (14). Several recent international studies have investigated the prevalence of eco-emotions and their relevance to PEB (16-19). For instance,

in a multinational study with 10,000 participants, Hickman and colleagues (15) found that many young people experienced negative eco-emotions such as fear (67%), anxiety (61%), worry (60%), anger (57%), and guilt (50%) when thinking about climate change, while much smaller proportions felt optimistic (30%) and indifferent (29%).

Negative eco-emotions are not only common, but also have increased over time. Leviston and colleagues (16) found that between 2010 and 2013 Australians became more ashamed and guilty when thinking about climate change and less hopeful. Leiserowitz and colleagues (17) found a similar trend in the US, with two thirds of Americans being worried about climate change, which is an increase of approximately 10% within five years (2014 to 2019). Furthermore, the number of Americans feeling very worried (30%) about climate change tripled during this period. Overall, research suggests that people around the world exhibit a broad range of emotional responses to environmental challenges, including negative emotions such as worry, fear, and shame, but also more positive emotions such as hope and optimism.

## **Eco-emotions and PEB**

Emotions play a key role in shaping attitudes and threat appraisals, both of which have been shown to be important determinants of behavior. For example, Ajzen's theory of planned behavior (18) posits that emotions may lead individuals to generate positive or negative attitudes, which influence intentions and behavior. Similarly, Slovic's and colleagues' affect heuristic model (19) suggests that people's affective response (general feelings of goodness or badness) towards an object, event, or behavior can influence risk appraisals, which in turn can increase or decrease the likelihood of future actions.

There is also considerable evidence to suggest that specific emotions are predictive of decisions to engage or not engage in PEB. An extensive literature on fear appeals indicates that fear can elicit behaviors to reduce external threats, particularly when accompanied by

information that boosts self-efficacy (20). Stanley and colleagues (21) found that Australians who experienced higher levels of eco-anger and eco-depression were more likely to engage in climate activism. In comparison, those reporting eco-anxiety were less likely to engage in pro-environmental actions (21). However, a multinational study (22) across 32 countries found that experiencing anxiety towards climate change was associated with pro-environmental behavior and environmental activism. The authors did also note that increased levels of climate anxiety are associated with detrimental mental health outcomes, suggesting there is a trade-off between PEB and mental health which has to be considered.

Theorists argue that emotions may facilitate PEB by serving as a mechanism to “concretize” or reduce the psychological distance of abstract environmental problems like climate change, for which the most extreme impacts are often perceived to be highly uncertain, likely to take place far in the future, in distant locations, and impacting dissimilar others (23, 24). This concretization process can enhance the salience of environmental problems, feelings of perceived personal vulnerability, and empathy for affected others, all of which may further enhance PEB (25).

### **Moving beyond discrete emotions to emotion patterns**

Most studies on emotions and PEB to date examined the role of how specific emotions in isolation predict human responses to environmental problems (21, 26-30). However, it is important to recognize that eco-emotions often co-occur, and that the overall pattern of emotions may help us to understand why people respond or fail to respond to environmental threats. Smith and Leiserowitz (31) found that a combination of five eco-emotions (worry, hope, interest, guilt, and disgust) explained 50% of the variance in climate change policy support, explaining PEB better than worldviews and sociodemographic variables. While this highlights the importance of eco-emotions for sustainable behavior, the way in which multiple eco-emotions combined predict PEB is complex. Ojala (32), for

instance, found that hope predicted PEB, but only for individuals who were also worried about environmental problems. One explanation for this may be that when people are hopeful, but not worried, hope is based on denial, but when people are hopeful and worried, they experience constructive hope which increases the motivation to practice PEB (33).

Wang and colleagues (34) further extended our understanding of the complex interplay of eco-emotions by evaluating whether a combination of a wider range of eco-emotions (13 emotions in total) predicted PEB. Using hierarchical cluster analysis, they identified four audience segments with distinct sets of eco-emotions which were characterized as having either strong negative emotions (scoring high on negative emotions such as anger and fear, but low on positive emotions like hope), weak negative emotions (scored similar to those with strong negative emotions, but with lower intensity), no emotions (experienced low levels of both negative and positive emotions), and ambivalent emotions (experienced both positive and negative emotions). Members of the strong negative emotions segment reported significantly higher levels of support for climate friendly policies and environmental funding compared to members of the weak negative emotions and ambivalent-emotions segments. Members of the no emotions segment exhibited the lowest levels of policy and funding support.

## **The current study**

The current study seeks to deepen our understanding of which eco-emotions tend to co-occur and how patterns of emotions predict environmental concern and willingness to sacrifice. Our study extends Wang and colleagues' (29) work both conceptually and methodologically. First, whereas Wang and colleagues focused on eco-emotions related to climate change, we focused more broadly on emotional responses towards environmental problems. Second, while they investigated how members of each eco-emotions segment differed in terms of their support for climate-friendly policies and funding, we analyzed how

our identified emotions segments predict environmental concern and willingness to make a broad range of personal sacrifices related to climate change mitigation but also more general to environmental sustainability. Measuring willingness to sacrifice considers that pro-environmental decisions are often a trade-off between doing what is best for oneself versus what is best for the environment (35). In contrast to behavioral measures, willingness to sacrifice is a more diverse measure as it can cover a wide range of intentions for various pro-environmental behaviors rather than assessing context specific behaviors. Third, whereas Wang and colleagues created eco-emotion segments based on a relatively restricted set of 13 emotions, we assessed a larger group of 23 discrete emotions to create a segmentation solution. Our selection of eco-emotions includes different aspects of unhappy emotions (i.e., sad, hurt, depressed, grief), fear-related emotions (i.e., anxious, afraid, worried), positive emotions (i.e., hopeful, optimistic, happy), and an empathetic emotion (i.e., compassion) which were previously not assessed in detail by Wang and colleagues. Using a larger set of eco-emotions allows us to evaluate the possible effects of emotions on environmental concern and willingness to sacrifice in a more complete and nuanced manner.

Based on Wang's and colleagues' (29) findings, we hypothesized that there would be at least three eco-emotion segments in our sample: negative eco-emotions, no emotions, and ambivalent emotions (a mix of positive and negative eco-emotions). We also predicted that the identified segments would differ significantly in their environmental concern and willingness to sacrifice, with those groups feeling stronger negative eco-emotions exhibiting the highest levels of environmental concern and willingness to sacrifice for the natural environment, and those with no eco-emotions exhibiting the lowest levels.

## Method

### Participants

The study was conducted in August 2022 and used a Cint online panel sample of New Zealanders. Cint is one of the largest digital survey-based providers with access to over 500,000 panelists (36). To ensure survey data quality, Cint (37) uses a detection system to prevent duplicates and fraud, and suppliers adhere to industry standards (38). Of the 405 New Zealand residents recruited, 119 participants were excluded from the survey as they either did not complete the survey or did not pass all three attention checks. The final sample consisted of 286 participants aged 18 to 89 years ( $M = 43.13$ ,  $SD = 17.53$ ;  $Median = 40.00$ ; S1 Table). Compared to 2018 census data (39), participants in the current sample were slightly older (median age in current study: 40.00 years; census: 37.40 years), more educated (participants holding an undergraduate degree or higher in current study: 41%; census: 25%), and consisted of more females (current study: 66%; census: 51%). In terms of ethnicity, the current sample resembled the New Zealand population (current study: 67% European, 17% Māori; census: 68% European, 15% Māori). Most participants lived in cities or suburban areas (64%), while 36% lived in rural residential, semi-rural, and rural areas.

### Procedure and measures

Following a review and approval of this study by the University of Canterbury Human Ethics Committee, a Qualtrics online survey (40) was conducted. At the beginning of the survey, participants were informed about the purpose of the study and that responses would be anonymous. Moreover, informed consent was obtained, participants were told that they could choose to withdraw at any time from the survey, and a helpline was provided in case any of the questions caused them distress.



After answering questions about their socio-demographic background, participants were asked how they feel towards environmental problems by rating 23 different types of eco-emotions (sad, hurt, angry, disgusted, frustrated, afraid, anxious, worried, ashamed, guilty, despair, depressed, grief, helpless, powerless, indifferent, bored, confused, doubtful, optimistic, hopeful, happy, compassionate). All emotion items were derived from previous research by Hickman and colleagues (15) and Pihkala (14) and were measured on a 5-point Likert scale (1 = never to 5 = almost always).

Next, participants' environmental concern was measured using an amended version of the *Concern for Climate Change* scale applied by Jones and colleagues (24). The scale consisted of seven items, of which one item was reverse coded ("I am not overly concerned about environmental problems such as climate change as I think the impacts are probably exaggerated"). All items were measured on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Internal consistency for this scale was very high (Cronbach's  $\alpha = .92$ ).

Finally, participants' willingness to make sacrifices for the natural environment was assessed with a newly developed 24-item scale. As measuring PEB in real world settings is often difficult, we employed a measure of PEB intentions based on the concept of willingness to sacrifice. Willingness to sacrifice, which is "the extent to which individuals' decisions will take into account the well-being of the environment, even at the expense of immediate self-interest, effort, or cost" (35 p259), has been found to be one of the strongest predictors of PEB, over and above knowledge, concern, and socio-economic characteristics (35). Although several *willingness to sacrifice* scales exist (26, 35), their focus is quite narrow. We developed a new scale to assess a broader range of sustainable behaviors related to transportation, food, electricity, and recycling, which were not assessed by existing scales. All items were measured on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). While exploratory factory analysis, using principal axis factoring, revealed four

eigenvalues above one, the scree plot clearly indicated a one-factor solution. All solutions from one to four were subjected to promax rotations. Solutions two to four exhibited a high number of cross-loadings, and several items did not load strongly on any factor. Consistent with the scree plot, the one-factor solution was most interpretable and therefore retained to construct a unidimensional measure of willingness to sacrifice. The average of the 24 items was calculated to create a single score. Internal consistency for this scale was very high (Cronbach's  $\alpha = .92$ ). Details of the questionnaire are shown in S2 Appendix.

## Statistical methods

To analyze the data (42), SPSS 28 (43) was used to conduct descriptive statistical analysis and assess bivariate correlations among all study variables. To classify participants based on their eco-emotions into homogeneous segments, a latent profile analysis was then performed with MPlus 8 (44). To test if the segments differed significantly in their eco-emotions and in their demographic characteristics, several post-hoc one-way analyses of variance (ANOVAs) were carried out with SPSS 28. Then, a multivariate analysis of variance (MANOVA) was conducted with SPSS 28 to determine if the identified segments differed along a combination of environmental concern and willingness to sacrifice. The MANOVA was followed by two one-way ANOVAs to validate the segments.

## Results

### Descriptive statistics and bivariate correlations

Means, standard deviations, and bivariate correlations between all variables are presented in Table 1. Most eco-emotions were significantly positively correlated with environmental concern, apart from indifferent and bored which were significantly negatively

241 correlated with environmental concern. Optimistic, hopeful, and happy were not significantly  
242 correlated with environmental concern. In regard to willingness to sacrifice, most eco-  
243 emotions were significantly positively correlated with willingness to sacrifice, apart from  
244 bored which was negatively correlated. Indifferent and happy were not significantly  
245 correlated with willingness to sacrifice.

**Table 1. Descriptive statistics and correlation matrix of study variables**

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 Sad	2.80	1.31	—																								
2 Helpless	2.65	1.33	.60**	—																							
3 Anxious	2.43	1.27	.65**	.57**	—																						
4 Afraid	2.42	1.28	.69**	.59**	.74**	—																					
5 Optimistic	2.20	1.12	.02	-.09	.01	.04	—																				
6 Angry	2.51	1.34	.77**	.56**	.67**	.71**	.02	—																			
7 Guilty	2.31	1.29	.63**	.56**	.61**	.60**	-.01	.65**	—																		
8 Ashamed	2.33	1.30	.69**	.51**	.60**	.62**	.02	.66**	.73**	—																	
9 Hurt	2.21	1.27	.64**	.53**	.60**	.66**	.09	.70**	.57**	.60**	—																
10 Depressed	2.07	1.20	.60**	.49**	.57**	.50**	.03	.57**	.50**	.53**	.56**	—															
11 Despair	2.30	1.23	.67**	.56**	.65**	.62**	.02	.66**	.61**	.62**	.66**	.59**	—														
12 Grief	2.13	1.15	.61**	.50**	.54**	.61**	.11	.64**	.52**	.58**	.63**	.54**	.62**	—													
13 Powerless	2.90	1.35	.46**	.74**	.47**	.50**	-.06	.45**	.47**	.43**	.46**	.42**	.45**	.43**	—												
14 Indifferent	1.92	1.06	.06	.14*	.15**	.16**	.15**	.12*	.14*	.09	.24**	.19**	.11	.19**	.24**	—											
15 Hopeful	2.34	1.13	.06	-.09	.09	.05	.60**	.02	.04	.10	.11	.10	.06	.14*	-.03	.19**	—										
16 Disgusted	2.64	1.38	.70**	.58**	.57**	.60**	.02	.74**	.63**	.63**	.63**	.51**	.64**	.58**	.49**	.11	.06	—									
17 Happy	1.75	1.07	-.14*	-.17**	-.05	-.05	.41**	-.12*	-.12*	-.10	.01	-.05	-.10	-.04	-.18**	.26**	.47**	-.10	—								
18 Compassionate	2.81	1.18	.44**	.24**	.35**	.34**	.22**	.37**	.33**	.33**	.37**	.32**	.38**	.39**	.17**	-.03	.39**	.38**	.23**	—							
19 Confused	2.12	1.13	.33**	.45**	.48**	.49**	.15*	.42**	.45**	.42**	.40**	.40**	.47**	.44**	.38**	.29**	.11	.40**	.08	.15*	—						
20 Bored	1.64	1.00	.05	.12	.13*	.17**	.17**	.08	.09	.11	.14*	.24**	.10	.22**	.13*	.54**	.19**	.13*	.26**	.02	.27**	—					
21 Doubtful	2.28	1.17	.41**	.46**	.45**	.47**	.09	.43**	.42**	.45**	.51**	.39**	.42**	.47**	.47**	.26**	.10	.45**	.09	.22**	.36**	.24**	—				

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
22 Worried	2.81	1.28	.74**	.60**	.72**	.72**	.06	.72**	.61**	.63**	.63**	.58**	.69**	.62**	.49**	.12*	.10	.63**	-.12*	.37**	.47**	.06	.47**	—			
23 Frustrated	2.77	1.32	.73**	.59**	.66**	.64**	-.02	.77**	.60**	.61**	.61**	.51**	.64**	.56**	.50**	.05	.06	.76**	-.11	.41**	.40**	.03	.45**	.72**	—		
24 Environmental Concern	3.66	.95	.58**	.41**	.52**	.50**	-.03	.53**	.45**	.49**	.44**	.35**	.50**	.42**	.25**	-.20**	.08	.47**	-.10	.39**	.17**	-.17**	.22**	.57**	.53**	—	
25 Willingness to Sacrifice	3.26	.76	.40**	.29**	.42**	.34**	.12*	.42**	.34**	.34**	.35**	.29**	.41**	.36**	.16**	-.09	.20**	.40**	.02	.44**	.20**	-.12*	.19**	.39**	.39**	.59**	—

*N* = 286. All items were measured on a 5-point Likert scale (1 = minimum to 5 = maximum). \*  $p < .05$ . \*\*  $p < .01$ .

## Segmentation analysis based on eco-emotions

LPA was conducted to investigate whether unique homogenous segments with distinct sets of eco-emotions exist. To assess the model fit, entropy (measure of classification uncertainty; 45), Akaike's information criterion (AIC), and the Lo-Mendell-Rubin likelihood ratio test (LMR) were used. In general, the model with the smallest AIC values and the highest entropy (ranging from 0 to 1, with higher values indicating higher classification certainty) is the best fitting model (45-48). The LMR is a test comparing the likelihood of one model with  $k$  segments to a model with  $k-1$  variables (45). A significant result of the LMR indicates that a model with  $k$  segments fits the data better than a model with  $k-1$  segments. Model fit indices for two- to five-segment solutions are shown in Table 2.

**Table 2. Model fit indices for two to five segment solutions for eco-emotions**

Segment Solution	AIC	BIC	Entropy	LMR	$p$
2	18824.74	19080.66	.97	2563.33	< .001
<b>3</b>	<b>18234.13</b>	<b>18577.79</b>	<b>.95</b>	<b>633.94</b>	<b>.001</b>
4	18807.88	18439.29	.93	272.24	.600
5	17909.01	18428.16	.94	145.79	.283

AIC = Akaike's information criterion. BIC = Bayesian information criteria. LMR = Lo-Mendel-Rubin likelihood ratio test. Lower AIC and BIC values suggest a better model fit. Higher entropy indicates higher classification certainty. A significant LMR test indicates that a model with  $k$  segments fits the data significantly better than a model with  $k-1$  segments.

A classification consisting of three segments fit the data significantly better than a two-segment solution, and a four-segment solution did not fit the data significantly better than a three-segment solution. The three-segment solution had a lower BIC value than the two-segment solution, indicating a better fit of the data. Entropy for the three-segment

solution was high (.95), indicating high classification certainty (45). Moreover, the three-segment solution was more interpretable than the other segment solutions. As such, the three-segment solution was retained and analyzed. The three segments were labelled emotionally detached, emotionally ambivalent, and empathic alarmed. Fig 1 presents the deviation from the scale midpoint for all eco-emotions of the three identified segments.

**Fig 1. Centered eco-emotions scores of the emotionally-detached, emotionally-ambivalent, and empathic-alarmed segments.** *Notes.* Participants were asked to rate how environmental problems made them feel.  $N = 286$ . Emotionally detached,  $n = 114$ . Emotionally ambivalent,  $n = 97$ . Empathic alarmed,  $n = 75$ . Scores were centered and ranged from -2 (strongly disagree) to +2 (strongly agree).

The emotionally-detached segment, which comprised 40% of all respondents, scored well below the mid-point on all eco-emotions assessed in the study. Members of the second largest segment, the emotionally ambivalent (34%), scored below the scale midpoint for all emotions, apart from disgust and worry, which were at the scale midpoint, and sadness and frustration, which were slightly above the scale midpoint. The emotionally ambivalent had significantly higher levels of all negative eco-emotions (i.e., grief, despair, ashamed, hurt, depressed, guilty, angry, disgusted, afraid, confused, anxious, sad, frustrated, doubtful, worried, helpless, powerless) and compassion than the emotionally detached (Table 3). However, these two segments did not differ significantly in their positive (i.e., optimistic, hopeful, happy) and apathetic (i.e., indifferent, bored) eco-emotions. The third segment, the empathic alarmed, was the smallest segment (26%) and scored above the scale midpoint for

most eco-emotions, with sadness, worry, and frustration being the highest rated eco-emotions. The empathic-alarmed segment scored below the scale midpoint for optimism, indifference, hope, happiness, confusion, and boredom. Compared to the emotionally ambivalent and emotionally detached, the empathic alarmed had significantly higher levels of all negative eco-emotions and compassion, but did not differ significantly in their positive and apathetic eco-emotions.



**Table 3. Eco-emotions: mean scores, standard deviations, and mean differences across emotionally-detached, emotionally-ambivalent, and empathic-alarmed segments**

Segment Variables	<i>Emotionally detached</i> ( <i>n</i> = 114)		<i>Emotionally ambivalent</i> ( <i>n</i> = 97)		<i>Empathic alarmed</i> ( <i>n</i> = 75)		<i>Univariate</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	$\eta^2$
Grief	1.25 <sup>a</sup>	0.43	2.28 <sup>b</sup>	0.90	3.29 <sup>c</sup>	1.08	157.81***	.51
Despair	1.25 <sup>a</sup>	0.49	2.49 <sup>b</sup>	0.84	3.63 <sup>c</sup>	1.01	223.42***	.60
Ashamed	1.26 <sup>a</sup>	0.48	2.44 <sup>b</sup>	0.96	3.80 <sup>c</sup>	1.00	240.27***	.61
Hurt	1.28 <sup>a</sup>	0.56	2.15 <sup>b</sup>	0.99	3.68 <sup>c</sup>	0.96	198.45***	.57
Depressed	1.33 <sup>a</sup>	0.63	1.92 <sup>b</sup>	0.95	3.37 <sup>c</sup>	1.09	109.21***	.47
Guilty	1.34 <sup>a</sup>	0.62	2.39 <sup>b</sup>	0.97	3.69 <sup>c</sup>	1.12	154.62***	.53
Angry	1.34 <sup>a</sup>	0.56	2.71 <sup>b</sup>	0.92	4.04 <sup>c</sup>	0.88	307.01***	.66
Disgusted	1.41 <sup>a</sup>	0.66	3.00 <sup>b</sup>	1.06	4.03 <sup>c</sup>	0.90	260.22***	.60
Afraid	1.41 <sup>a</sup>	0.62	2.40 <sup>b</sup>	0.92	3.96 <sup>c</sup>	0.83	261.53***	.63
Confused	1.50 <sup>a</sup>	0.77	2.23 <sup>b</sup>	1.00	2.93 <sup>c</sup>	1.19	48.71***	.26
Anxious	1.50 <sup>a</sup>	0.73	2.36 <sup>b</sup>	0.84	3.93 <sup>c</sup>	0.94	181.60***	.58
Sad	1.62 <sup>a</sup>	0.67	3.03 <sup>b</sup>	0.88	4.28 <sup>c</sup>	0.69	349.61***	.67
Frustrated	1.63 <sup>a</sup>	0.73	3.04 <sup>b</sup>	1.04	4.13 <sup>c</sup>	0.72	273.01***	.59
Doubtful	1.67 <sup>a</sup>	0.93	2.36 <sup>b</sup>	1.00	3.12 <sup>c</sup>	1.17	42.90***	.25
Worried	1.72 <sup>a</sup>	0.77	3.00 <sup>b</sup>	0.94	4.24 <sup>c</sup>	0.59	322.16***	.62
Helpless	1.82 <sup>a</sup>	1.04	2.59 <sup>b</sup>	0.94	3.97 <sup>c</sup>	1.07	93.51***	.42
Powerless	2.15 <sup>a</sup>	1.21	2.94 <sup>b</sup>	1.14	4.00 <sup>c</sup>	1.04	62.95***	.30
Compassionate	2.24 <sup>a</sup>	1.07	2.95 <sup>b</sup>	1.05	3.51 <sup>c</sup>	1.06	33.44***	.19
Bored	1.51 <sup>a</sup>	0.91	1.60 <sup>a</sup>	0.94	1.91 <sup>a</sup>	1.18	3.10	.03
Indifferent	1.77 <sup>a</sup>	0.95	1.94 <sup>a</sup>	0.97	2.13 <sup>a</sup>	1.28	2.35	.02
Happy	1.86 <sup>a</sup>	1.14	1.65 <sup>a</sup>	1.04	1.71 <sup>a</sup>	1.00	1.03	.01
Optimistic	2.18 <sup>a</sup>	1.16	2.12 <sup>a</sup>	1.05	2.33 <sup>a</sup>	1.16	0.77	.01
Hopeful	2.24 <sup>a</sup>	1.10	2.28 <sup>a</sup>	1.06	2.59 <sup>a</sup>	1.23	2.15	.02

*N* = 286. *V* = 1.10,  $F(46, 524) = 13.94$ ,  $p < .001$ ,  $\eta^2 = .55$ . Means with different superscripts (in rows) differ significantly at  $p < .01$  (Gabriel). \*\*\*  $p < .001$ .

In terms of demographic characteristics, the three segments differed significantly only in age. Members of the emotionally-detached ( $M$  age = 48.54,  $SD$  = 18.04) and emotionally-

ambivalent ( $M$  age = 43.39,  $SD$  = 17.15) segments were significantly older than the empathic  
alarmed ( $M$  age = 34.56,  $SD$  = 13.62). Table 4 contains a demographic breakdown of the  
three retained segments.

**Table 4. Demographic characteristics of the emotionally-detached, emotionally-ambivalent, and empathic-alarmed segments**

Segment Variables	<i>Emotionally detached</i> ( $n = 114$ )		<i>Emotionally ambivalent</i> ( $n = 97$ )		<i>Empathic alarmed</i> ( $n = 75$ )		<i>Univariate</i>	
	$M$	$SD$	$M$	$SD$	$M$	$SD$	$F$	$r$
Age	48.54 <sup>a</sup>	18.04	43.39 <sup>a</sup>	17.15	34.56 <sup>b</sup>	13.62	18.89***	-0.31
	%	$Z_{Resid}$	%	$Z_{Resid}$	%	$Z_{Resid}$	$\chi^2(df)$	$V$
Gender:							8.92(4)	0.12
Male	39	1.07	30	-0.51	28	-0.74		
Female	61	-0.66	70	0.44	69	0.31		
Non-binary	0	-0.89	0	-0.82	3	2.04		
Education:							15.73(12)	0.14
Lower than secondary school	4	0.75	2	-0.60	3	-0.23		
Secondary school	31	0.86	24	-0.55	24	-0.43		
Trade / professional / technical qualification	34	0.95	25	-0.84	28	-0.22		
Undergraduate degree	16	-1.14	28	1.56	19	-0.37		
Honours / postgraduate degree	10	-0.88	13	0.23	16	0.83		
Master's degree	4	-0.81	8	0.77	7	0.13		
PhD	1	-0.47	0	-1.16	4	1.90		
Living Area:							10.65(8)	0.14
Inner City	15	-1.05	21	0.31	24	0.94		
Suburban	43	-0.28	51	0.85	40	-0.62		
Residential in rural town	18	1.02	12	-0.43	11	-0.77		
Semi-rural	5	-0.57	8	0.61	7	0.01		
Rural	19	1.07	8	-1.79	19	0.72		

$N = 286$ . Means with different superscripts (in rows) differ significantly at  $p < .01$  (Gabriel).  $r$  = Pearson's correlation coefficient.  $Z_{Resid}$  = adjusted standardized residual.  $V$  = Cramer's  $V$ .  $\chi^2$  analyses conducted with 10000 bootstrap samples. \*\*\*  $p < .001$ .

## Segment membership, environmental concern, and willingness to sacrifice

A MANOVA was used to investigate whether the segments differed significantly in their environmental concern and willingness to sacrifice. The MANOVA revealed a significant effect ( $\Lambda = 0.69$ ,  $F(4, 566) = 25.93$ ,  $p = .001$ ), with segment membership explaining 31% of the variance in the combined dependent variables (environmental concern and willingness to sacrifice). Two follow-up one-way ANOVAs revealed statistically significant large main effects of group membership on levels of environmental concern,  $F(2, 186.82) = 59.56$ ,  $p < .001$ ,  $\eta^2 = .29$ , and willingness to sacrifice,  $F(2, 180.16) = 29.75$ ,  $p < .001$ ,  $\eta^2 = .18$ , indicating that the segments differed significantly in their levels of environmental concern and willingness to sacrifice. Results from Gabriel's post hoc tests revealed that members of the empathic-alarmed segment ( $M = 4.33$ ,  $SD = 0.62$ ) had significantly higher levels of environmental concern ( $p < .001$ ) than members of the emotionally-ambivalent ( $M = 3.83$ ,  $SD = 0.72$ ) and the emotionally-detached ( $M = 3.08$ ,  $SD = 0.96$ ; Fig 2) segments. Moreover, emotionally-ambivalent respondents were significantly more concerned about the environment than emotionally-detached ones ( $p < .001$ ).

For willingness to sacrifice, members of the empathic-alarmed ( $M = 3.67$ ,  $SD = 0.65$ ) and emotionally-ambivalent ( $M = 3.37$ ,  $SD = 0.63$ ) segments scored significantly higher ( $p < .001$ ) than the emotionally-detached segment ( $M = 2.89$ ,  $SD = 0.76$ ). Respondents in the empathic-alarmed segment were also significantly more willing to make sacrifices for the environment than the respondents in the emotionally-ambivalent segment ( $p = .015$ ). Overall, these findings support our hypothesis that, based on participants' emotional responses to environmental problems, several segments exist, and that members of each segment differ significantly in their environmental concern and willingness to sacrifice.

**Fig 2. Mean scores for environmental concern and willingness to sacrifice of the emotionally-detached, emotionally-ambivalent, and empathic-alarmed segments.** *Notes.*  $N = 286$ . Emotionally detached,  $n = 114$ . Emotionally ambivalent,  $n = 97$ . Empathic alarmed,  $n = 75$ . Error bars represent 95% confidence interval. Environmental concern was measured with seven items on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Willingness to sacrifice was measured with 24 items, all measured on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

## Discussion

The current study aimed to extend our understanding of which eco-emotions occur together, and how patterns of eco-emotions predict environmental concern and willingness to make sacrifices for the environment. We found that respondents could be segmented into three main profile groups based on their emotional responses to environmental problems. Moreover, our results indicated that group membership predicted both, environmental concern and willingness to make sacrifices for the natural environment. Each of these findings is discussed in more detail in the sections that follow, along with a discussion of practical implications and limitations of the research.

### Eco-emotion profile groups

Applying latent profile analysis to 23 eco-emotions, we identified three distinct segments which were characterized as being emotionally-detached (40%), emotionally-ambivalent (34%), or empathic-alarmed (26%) about environmental problems such as climate change. We found that the segments differed in their levels of negative eco-emotions and compassion, but not in their positive (i.e., optimism, hope, happiness) and apathetic eco-emotions (i.e., indifference, boredom). The largest segment, the emotionally detached, reported lower levels of all negative eco-emotions and compassion than the emotionally

ambivalent who in turn reported less intense negative eco-emotions and compassion than the smallest segment, the empathic alarmed. As the three segments only differed in their negative eco-emotions and compassion, but not in their positive and apathetic eco-emotions, hypothesis 1 was only partially supported.

In terms of their socio-demographic characteristics, the three segments differed in age, but not in gender, education, and living area. The empathic alarmed were younger than the emotionally ambivalent and the emotionally detached. This aligns with previous studies which found that younger generations tend to be more engaged and emotionally involved with environmental problems (50) than older generations (e.g., feeling more anxious, angry, and less annoyed when shown climate change related social media content).

The identified segments have some similarities with those reported by Wang and colleagues (34) who surveyed Australian residents, but also some key differences. Wang and colleagues identified four segments, which differed in both their intensities and valence of eco-emotions. Their segments were characterized as either feeling strong negative emotions (e.g., anger and fear), weak negative emotions (e.g., anger and fear experienced with lower intensity), ambivalent emotions (moderate levels of positive and negative emotions), or no emotions (low levels of positive and negative emotions). In contrast to their segmentation, we identified three segments, which differed only in their intensity of experienced eco-emotions. Using a different statistical approach may have contributed to these findings. While Wang and colleagues used hierarchical cluster analysis to identify emotion profiles within their sample, we employed latent profile analysis (LPA), which is considered the gold standard for segmenting populations and allowed us to use fit indices to identify a segment solution which best fits the data (51, 52). Moreover, while Wang and colleagues reported differences between the four segments in positive (i.e., hopeful, joyful, excited), apathetic (i.e., bored), and negative eco-emotions (e.g., angry, irritated), the segments in the current study only

differed in their negative eco-emotions and compassion. The emotionally-detached segment in the current study was similar to the no emotion segment identified by Wang and colleagues, in that they both experienced low levels of all eco-emotions. However, the no-emotion segment (24%) they identified was only around half the size of the emotionally-detached segment found in the current study (40%). This suggests a potential cross-cultural difference, with a higher proportion of New Zealanders compared to Australians being emotionally-detached with environmental problems. One explanation for this could be that Australians are more directly impacted by environmental problems such as climate change than New Zealanders (53), resulting in Australians having less psychological distance towards environmental issues (24), which in turn may have led to a greater emotional response (54).

### **Emotion patterns predict environmental concern and willingness to sacrifice**

As hypothesized, segment membership predicted how environmentally concerned and willing to make sacrifices the segments were. All segments experienced different levels of environmental concern, with the empathic alarmed being the most concerned, followed by the emotionally ambivalent and the emotionally detached. In terms of willingness to sacrifice, individuals who were empathic alarmed were more willing to give up unsustainable behaviors than emotionally-ambivalent individuals, who in turn were more willing to make sacrifices for the environment than the emotionally detached. The stronger negative eco-emotions felt by the empathic alarmed and emotionally ambivalent may have made the risks associated with environmental problems be perceived as less abstract and thus riskier (6, 9, 55, 56), resulting in greater environmental concern and willingness to make sacrifices. Overall, our findings align broadly with those of previous research, in that emotions are important in shaping pro-environmental attitudes and decision-making processes. Our study

supports previous research that suggests eco-emotions may be critical to be concerned about environmental problems (23), to be willing to make sacrifices for the natural world (26), and to perform PEB (31, 34). Experiencing eco-emotions may have helped to concretize abstract environmental problems and in turn increased the motivation to perform PEB (9, 27, 55-58).

A difference to previous findings (31, 34, 59) was that three segments identified in this study differed primarily in their experienced magnitude of negative eco-emotions and compassion. This suggests that a combination of these types of eco-emotions sets groups of people apart from each other. The importance of negative eco-emotions aligns with findings of a meta-analysis by van Valkengoed and Steg (60), who found that together with outcome efficacy and descriptive norms, negative affect was a strong predictor for a range of climate change adaptation behaviors such as policy support. The unpleasantness of a negative emotional arousal caused by experiencing a range of negative emotions may have acted as a motivator to increase intentions to act environmentally-friendly (61).

In addition to differences in all negative emotions between the three segments, members of the emotionally-detached, emotionally-ambivalent, and empathic-alarmed segments differed in their levels of compassion, a finding that contributes to previous research in this area (62, 63). In a recent study, Pfattheicher and colleagues (63) found that participants who were assigned to a high-compassionate condition (i.e., had to imagine how a person feels) had higher pro-environmental intentions than those assigned to a low-compassionate condition. Similar results were reported by Engel and colleagues (62) who found that entrepreneurs who listened to a guided loving-kindness meditation had higher levels of compassion and made more sustainable decisions than a group which only listened to a talk about meditation (without actually meditating). In their study, the relationship between the loving-kindness meditation and pro-environmental decision making was mediated by compassion. In the current study, compassion, which evokes a feeling for the

suffering of others (64), may have increased the awareness of how one's actions impact others negatively and elicited moral concern (62, 63). This in turn may have acted as a motivator for alleviating the suffering of others and hence may have contributed to the willingness to practice PEB.

## **Practical implications**

The results of the current study support the view that emotions may be critical for guiding judgements and decisions related to PEB. The fact that the three segments differed primarily in terms of the relative intensity with which segment members experienced negative eco-emotions and compassion can help in the development of communication interventions, which evoke specific sets of emotions (i.e., by inducing a combination of negative emotions and compassion) to engage with groups of people more effectively.

Our results contribute to findings from a growing body of research on the effects of emotions on PEB. Invoking specific negative emotions such as guilt (26, 28-30, 65-67), fear (26, 29, 68), frustration, anger and depression (21), grief (30, 67), and worry (27) have previously all been found to promote PEB, while experiencing sadness and shame on their own were found to be associated with decreased levels of PEB (69). Mixed effects of anxiety on PEB were previously reported (21, 30, 70-72). The current study found that all negative emotions (including sadness, shame, and anxiety) were higher in groups that reported greater levels of environmental concern and willingness to sacrifice. Thus, it may be that the interaction of negative eco-emotions and compassion increases concern for the environment and intentions to sacrifice unsustainable behaviors. In order for individuals to shift to a segment that is more emotionally engaged and hence more motivated to make sacrifices to benefit the natural environment, it may be beneficial to induce a combination of negative eco-emotions and compassion.



To further support the success of interventions eliciting specific patterns of eco-emotions, additional factors may need to be considered, including the level of self-efficacy (20, 73), ethical considerations (21, 30, 70, 74), and potential adverse effects of too intensely experienced eco-emotions (75). Self-efficacy has previously been suggested to influence the course of action. According to the extended parallel process model (73), when facing a threat, experiencing negative emotions such as fear only leads to action when a high level of self-efficacy is present. However, when self-efficacy is low, individuals may deny the threat or actively react against the threat (e.g., “climate change is not real”) in order to manage their distressing emotions. Hence, to increase the success of emotion-inducing interventions it may be advisable to integrate a self-efficacy element (20). One way to achieve this is by providing information on how to decrease unsustainable behaviors. This in turn may increase confidence that one’s actions contribute to the planet’s health and therefore, lead to PEB. A second point to consider is the intensity of experienced eco-emotions. While the current study did not find a reversal effect of stronger experienced eco-emotions on environmental concern and willingness to sacrifice, Pihkala (75) suggests that when the intensity of negative eco-emotions (e.g., climate anxiety) is too high, it may paralyze people and thereby lead to inaction. Moreover, when negative eco-emotions are too strong, they were previously found to be associated with detrimental mental health outcomes and increased levels of insomnia (22, 74). Therefore, from an ethical point of view, it is important to develop emotion-inducing interventions with a safe level of intensity, which in turn may also contribute to an intervention’s success.

In summary, ensuring self-efficacy when inducing a combination of negative emotions with appropriate levels of intensity and compassion may be one way for individuals to move to segments that are more emotionally engaged (i.e., emotionally ambivalent and empathic alarmed), more environmentally concerned, and more willing to make sacrifices to

protect the environment. In fact, that would represent a great opportunity, given the emotionally ambivalent and emotionally detached represented nearly three quarters of all participants surveyed.

## **Limitations and future research**

When interpreting the findings of our study, several limitations have to be considered. In this study, we surveyed a broad range of New Zealand residents. In terms of age and ethnicity the current sample was roughly representative of the New Zealand population, but females were over-represented. Moreover, our sample may not be truly representative given that we relied on an online panel, which may have excluded certain groups within the population as the online survey required internet access and skills to navigate an online survey (76). To validate our findings, future studies can use an experimental design to test how messages which induce specific sets of eco-emotions impact individuals' environmental concern and pro-environmental intentions. A second limitation was the reliance on self-report measures which are prone to socially desirable answering (77) and may have affected the validity of this study. To mitigate this risk, participants were recruited through a third-party, the study was conducted online, and information provided was kept anonymous. Thirdly, given measuring PEB in real world settings is often difficult, we used willingness to sacrifice as a proxy measure for PEB. This allowed us to include a wide range of sustainable behaviors and hence have a more holistic picture of participants' pro-environmental intentions. While there may be a gap between self-reported willingness to sacrifice and actual behavior, research suggests that intentions are often the strongest predictor of behavior (78). Intentions that involve sacrifice may be particularly predictive given they suggest a willingness to engage in behaviors despite the barriers that may be present. Future research can extend and validate the findings of our study by investigating which factors predict eco-emotions of specific groups and by testing whether messages which induce a combination of negative

emotions and compassion simultaneously are more effective than messages that evoke a combination of other sets of eco-emotions. Further research is also required to examine the extent to which willingness to sacrifice measures of intent outperform more traditional intention measures in predicting behavior.

## Conclusion

In the current study we investigated which eco-emotions tend to co-occur and how patterns of these eco-emotions relate to pro-environmental action. Overall, this study supports the perspective that eco-emotions may play an important role in affecting how people experience environmental concern and willingness to sacrifice. We identified three segments with distinct sets of eco-emotions (emotionally detached, emotionally ambivalent, and empathic alarmed), with most participants being emotionally detached. Members of the three segments differed in the degree to which they experienced negative eco-emotions and compassion, but not in their experiences of eco-emotions reflecting positivity and apathy. The segments also significantly differed in levels of expressed environmental concern and willingness to sacrifice. Members of the empathic-alarmed segment felt more concerned about the environment and were more willing to make sacrifices for the environment than members of the emotionally-ambivalent group, who in turn expressed more concern about the environment and were more willing to make sacrifices to protect it than members of the emotionally-detached segment. Targeting the two largest segments (emotionally detached and emotionally ambivalent) with appeals that focus on eliciting combinations of negative emotions alongside compassion may prove to be an effective way to increase pro-environmental behavior in these groups.

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524    **Supporting information**

525    **S1 Table. Demographic characteristics**

526    **S2 Appendix. Questionnaire**

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**S1 Table. Demographic characteristics**

Variable	Sample
<b>Age (in years)</b>	
M (SD)	43.13 (17.53)
Median	40.00
<b>Gender (%)</b>	
Male	33
Female	66
Non-binary	1
<b>Ethnicity (%)</b>	
New Zealand European / Pākehā	67
Māori	17
Chinese	3
Others	13
<b>Highest Qualification (%)</b>	
Lower than secondary school	3
Secondary school	27
Trade / technical / professional qualification	29
Undergraduate Degree	21
Honours Degree or Postgraduate Certificate	13
Master's Degree	6
PhD	1
<b>Living Area (%)</b>	
Inner City	19
Suburban	45
Residential in rural town	14
Semi-rural	7
Rural	15

*Note.* Participants could choose more than one ethnicity. Ethnicity “Others” included Samoan (1%), Cook Island Māori (1%), Tongan (1%), Indian (1%).

## 547 **S2 Appendix. Questionnaire**

### 548 549 *Start of Survey*

550  
551 Before you proceed with the survey, please complete the captcha below

### 552 553 *Informed Consent & Welcome*

554  
555 Welcome to the research study!

556  
557 We are interested in better understanding Kiwis' feelings, beliefs, and behaviours related to  
558 environmental problems such as climate change.

559  
560 The questionnaire should take you around 10-15 minutes to complete. Your participation in  
561 this research is voluntary. You have the right to withdraw at any point during the study. All  
562 your responses will be completely anonymous.

563  
564 The Principal Investigator of this study is Andreas K Jaeger and can be contacted at  
565 aja223@uclive.ac.nz.

566  
567 This project has been approved by the Educational Research Human Ethics Committee  
568 (human-ethics@canterbury.ac.nz).

569  
570 Although this questionnaire is unlikely to raise any personal or upsetting issues, if it does you  
571 may wish to contact Lifeline on 0800 543 354 or your GP.

572  
573 By clicking the button below, you acknowledge:

574 Your participation in this research is voluntary.

575 You are 18 years of age or over.

576 You agree to participate in this study and are aware that you may choose to withdraw at any  
577 time for any reason.

### 578 579 *Sociodemographic*

580  
581 These first questions are to learn something about you

582  
583 What is your gender?

- 584  
585 ☐ Male  
586 ☐ Female  
587 ☐ Non-binary / third gender  
588 ☐ Prefer not to say  
589

What ethnic group do you belong to? Select all that apply to you.

- ☐ New Zealand European / Pākehā
- ☐ Māori
- ☐ Samoan
- ☐ Cook Islands Māori
- ☐ Tongan
- ☐ Niuean
- ☐ Chinese
- ☐ Indian
- ☐ Other (please specify) \_\_\_\_\_

What is the highest qualification you have received?

- ☐ Less than secondary school
- ☐ Secondary school qualification
- ☐ Trade / technical certificate or professional qualification
- ☐ Undergraduate qualification (Bachelors degree or Undergraduate Diploma)
- ☐ Bachelor Honours or Postgraduate Certificate, Diploma or Degree
- ☐ Masters degree
- ☐ PhD

Which of the following best describes the area where you live?

- ☐ Inner city
- ☐ Suburban
- ☐ Residential in rural town
- ☐ Semi-rural / Peri-urban (e.g., acreage on the edge of town)
- ☐ Rural

What is your age?

- ☐ 18
- ☐ 19
- ☐ 20

(up to 100)

### ***Eco-emotions, Environmental Concern & Willingness to Sacrifice***

For each of the words below, indicate how environmental problems such as climate change make you feel.

Please rate how much you agree with the following statements.

	Not at All	Slightly	Moderately	Very	Extremely
Sad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Helpless	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anxious	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Afraid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Optimistic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Angry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guilty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ashamed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hurt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Depressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Despair	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grief	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Powerless	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Indifferent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hopeful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Disgust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Happy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Compassionate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Confusion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Boredom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Doubt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Frustration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

637

638

	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
I am very concerned about environmental problems such as climate change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am very concerned about potential impacts of environmental problems such as climate change that may affect me personally.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am very concerned about potential impacts of environmental problems such as climate change that may affect society in general.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



I experience concern each time I see or read media coverage of the likely impacts and consequences of environmental problems such as climate change.

○ ○ ○ ○ ○

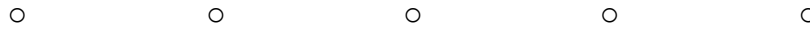
The more I learn about environmental problems such as climate change, the more concerned I become.

○ ○ ○ ○ ○

I am not overly concerned about environmental problems such as climate change as I think the impacts are probably exaggerated.

○ ○ ○ ○ ○

I am  
concerned  
that the  
impacts of  
environmental  
problems  
such as  
climate  
change will  
affect me in  
the  
foreseeable  
future.



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642 According to scientists, human behaviour is causing environmental problems such as climate  
643 change.

644

645 Please indicate on the scale below how willing you are to make changes to your behaviour to  
646 prevent environmental problems from happening.

	Strongly disagree	Mildly disagree	Neither disagree nor agree	Mildly agree	Strongly agree
I am willing to buy an electric car rather than a fossil-fuel car, even if the electric car is more expensive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To reduce my environmental impact, I often walk, cycle, or use public transport instead of driving my car to nearby places	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I try to avoid travelling within NZ by plane, even if travelling by plane is most convenient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to pay more for my flights to offset the carbon emissions produced through my flight	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to reduce my overseas travel by at least 50%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to adopt a meat-free diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to reduce my meat consumption by 50% to reduce my greenhouse gas footprint	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to use milk-alternatives instead of dairy milk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To show that you have read this sentence, in this line we ask you to mark 'Strongly agree' on the answer scale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I am willing to make an extra effort to find and buy locally produced food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to pay more for food that is environmentally-friendly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to compost food scraps instead of throwing them in the rubbish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to buy electric devices that have a better energy efficiency rating, even if they are more expensive than less energy efficient options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to pay more for electricity that comes renewable sources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In winter, I often put on an extra layer of clothes rather than turning the heater on	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to buy second-hand products over brand-new products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to avoid products with much packaging, even if they are more expensive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I avoid single-use products (e.g., straws, takeaway coffee cups) even though they are convenient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am planning not to have any children	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I am willing to pay higher taxes for conservation efforts in New Zealand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I generally try to buy new furniture where the wood is sustainably sourced, even when those products are more expensive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to accept less pay to work for a company/organization that has strong “green” policies and procedures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to take shorter showers to conserve water	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am willing to spend most of my holidays in New Zealand instead of going overseas by plane	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I support paying more money for clothes that are sustainable (made of natural fibres or recycled materials)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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