Predictors of New Zealanders' belief in anthropogenic climate change

Wokje Abrahamse[1], Taciano L. Milfont[2], and Edith A. MacDonald[3]

[1]School of Geography, Environment and Earth Sciences, Te Herenga Waka Victoria University of Wellington
[2]School of Psychological and Social Sciences, University of Waikato
[3]Department of Conservation

While there is a scientific consensus that climate change is happening and that it is predominantly caused by human activity, public opinion on this issue remains divided. When people do not accept that climate change is caused by human activity, they may be less likely to adopt climate mitigation behaviours and less willing to accept climate change related policies. It is therefore important to understand the predictors of people's beliefs about climate change. In this study, we examine the predictors of belief in anthropogenic climate change in a large, broadly representative sample of the New Zealand population (N = 8,199). We found that pro-environmental attitude was—by far—the strongest predictor of belief in anthropogenic climate change. People who expressed more positive environmental attitudes (i.e., who more strongly endorsed ecocentrism) were more likely to believe in anthropogenic climate change, compared with people who more strongly endorsed anthropocentrism. Age was the strongest socio-demographic predictor of climate change belief, with younger New Zealanders expressing a stronger belief in climate change. We also found that females were more likely to believe in anthropogenic climate change compared with men, and that this relationship was partially explained by gender differences in the endorsement of self-transcendence and tradition values. We discuss the implications of our findings for climate science communication and climate action in Aotearoa New Zealand.

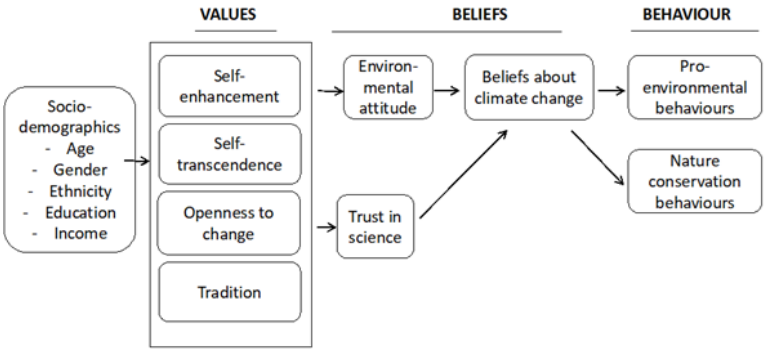
Keywords: *Belief in climate change, Values, Environmental attitudes*

INTRODUCTION

The vast majority of climate scientists agree that the climate is changing and that this is largely caused by human behaviour (Cook et al., 2016; IPCC, 2018; IPCC, 2021; Oreskes, 2004). The public, however, remains divided on this issue (e.g., Fisher et al., 2018; Leiserowitz et al., 2017; McCright et al, 2011; Weber, 2020). While many people in most countries believe that climate change is happening, fewer people believe that it is (mainly) caused by humans. For example, a survey in the UK found that only a third of respondents in the British Attitude Survey (36%) tended to agree with the conclusions of the Intergovernmental Panel on Climate Change (IPCC, 2014) that climate change is predominantly caused by humans (Fisher et al., 2018). A survey of the US public found that 13% of people do not believe in climate change at all (Leiserowitz et al., 2017). Although New Zealand findings show that people's belief in the reality and human causation of climate change is increasing over time (Milfont et al., 2017), overall these findings do raise some cause for concern. This is because when people do not accept anthropogenic climate change, they may be less likely to support action on climate change.

Beliefs about the causes of climate change are assumed to affect attitudes towards climate change and guide people's engagement in climate mitigation behaviours (Arbuckle, Morton, & Hobbs, 2013). Beliefs refer to people's understandings of the world and ideas that an individual trusts (Albarracin, & Johnson, 2018; Dietz et al., 2005; Wyer & Albarracín, 2005). In the influential book The Psychology of Attitudes, Eagly and Chaiken (1993, p. 1) define attitude as a "psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour". An attitude thus refers to an evaluative judgement (i.e., positive or negative) about a particular object, person, thing, or event. Extending this conceptualisation to the environmental domain, environmental attitudes have been defined as "a psychological tendency expressed by evaluating the natural environment with some degree of favour or disfavour" (Milfont & Duckitt, 2010, p. 80). In the literature, belief in anthropogenic climate change is conceptualised as the acceptance of (and scepticism about) anthropogenic climate change and/or whether people endorse or opposes the reality of climate change (see for example, Hornsey et al., 2016; Milfont et al., 2015). Beliefs influence the formation of attitudes and ultimately inform behavioural choices (Kruglanski & Stroebe 2005). When people do not accept that climate change is caused by human activity, they may be less likely to change their own behaviour, or support policies to reduce greenhouse gas emissions (Dietz et al., 2007; Moser & Dilling, 2010).

Figure 1. Proposed relationships between psychological variables, beliefs about climate change and engagement in pro-environmental behaviour (adapted from Dietz et al. [2005] and Stern [2000])



It is thus important to understand the psychological and socio-demographic predictors of people's beliefs about climate change. Interventions and policies that aim to encourage people to act on climate change will be more effective when they target the psychological predictors of people's climate change beliefs. For example, communications can be framed in such a way to align with people's existing beliefs about climate change (see Bain et al., 2012). The present study examines the predictors of beliefs in climate change in a large sample of the New Zealand population (N = 8,199), with a focus on key psychological predictors from prior literature on this topic (e.g., Dietz et al., 2007; Hornsey et al., 2016), including environmental attitudes, trust in science, and values. These predictors are part of a conceptual framework put forward by Dietz and colleagues (2007), which will be outlined in more detail below. Specifically, the study examines the relative predictive ability of socio-demographic characteristics and psychological variables. It also examines the extent to which climate change beliefs are associated with a range of pro-environmental and nature conservation behaviours. In doing so, this study provides one of the first analyses of the predictors of climate change beliefs and actions in a large, nationally representative sample of the New Zealand population.

Conceptual framework

The basis for this research lies in the conceptual framework proposed by Paul Stern and Tom Dietz and their collaborators (e.g., Dietz et al., 2007; Stern et al., 1999; Stern, 2000), which is depicted in Figure 1. In this framework, pro-environmental behaviours are guided by behaviour-specific beliefs and attitudes. Following the approach by Dietz et al. (2007), we include human values, environmental attitudes, and beliefs related to trust in science to assess the antecedents of behaviour. Thus, the assumption is that values shape pro-environmental behaviours indirectly via specific beliefs. The framework also includes socio-demographic variables, which are assumed to independently influence values, beliefs and behaviours. In this study, we use an adapted, simplified version of the model. The original model also includes variables such as 'information about climate change', 'future orientation', and 'pro-environmental personal normative beliefs'. Limitations to survey length meant that we were not able to include all variables. As such, we were not able to provide a test of the complete model and the proposed mediating relationships between all variables (for a full test of the model, see Dietz et al., 2007). Rather, we focus on the predictive ability of the variables in explaining climate change beliefs and behaviours (relative to socio-demographic variables). Below, we provide detail on each of the constructs in turn.

Values

Values are described as "concepts or beliefs, about desirable end states or behaviours that transcend specific situations" (Schwartz & Bilsky, 1987, p. 551). Values are conceptualised as guiding principles in people's lives that influence the decisions people make (Schwartz, 1992), and have been studied to help understand people's engagement with environmental issues (Dietz et al., 2005).

Schwartz' Values Theory (1992; 1994) proposes two contrasting value dimensions that form four higher order values. The first dimension includes self-enhancement vs. self-transcendence values, and distinguishes between values such as power, achievement and wealth (i.e., the pursuit of self-interest) and values such as social justice and care for nature (i.e., concern for the welfare of other people and the planet). The second dimension comprises openness to change vs. tradition values; it places values such as having an exciting life and new experiences in opposition with values related to custom and traditions. People differ in the extent to which these values are important to them as guiding principles in their lives.

Research findings show that values are associated with people's environmental beliefs and behaviours. For example, people with strong self-transcendence values tend to report higher levels of environmental concern (e.g., Stern, 2000), more positive environmental attitudes and beliefs (De Groot & Steg, 2008; Milfont & Gouveia, 2006), and engage more often in pro-environmental behaviours (e.g., Graham & Abrahamse, 2017; Karp, 1996; Poortinga et al., 2004). Those who more strongly endorse self-enhancement values, on the other hand, tend

to express lower levels of environmental concern and engagement in pro-environmental actions (De Groot & Steg, 2009). People who more strongly value openness to change are more likely to engage in certain pro-environmental behaviours (Abrahamse & Steg, 2011; Vermeir & Verbeke, 2008) and people who more strongly value tradition are less likely to engage in pro-environmental behaviours (Dietz et al., 2005). Compared with self-enhancement vs. self-transcendence values, however, the relationships between openness to change vs. tradition values and environmentally relevant variables is less strong.

A small but growing body of literature links values to public engagement with climate change (for a review, see Corner et al., 2014). Some of this work finds that self-transcendence values are positively associated with beliefs in anthropogenic climate change (Milfont et al., 2015) and support for emission reduction policies (Nilsson et al., 2004). For example, the study by Milfont and colleagues (2015) of the New Zealand public found that the belief in human caused climate change was higher among people who more strongly endorsed self-transcendence and openness to change values. Researchers from the UK have observed that people who endorse self-transcendence values tend to have higher levels of concern about climate change (e.g., Poortinga et al., 2011) and tend to be less sceptical about climate change (Whitmarsh, 2011). Moreover, a US study found that the relationship between self-transcendence values and support for climate mitigation policies was mediated by environmental attitudes (Dietz et al., 2005).

Environmental attitudes

The New Ecological Paradigm (NEP) is often used as an indicator of environmental attitudes. The NEP scale, developed by Riley Dunlap and his colleagues in the late 1970s and updated in the 2000s (Dunlap et al., 2000; Dunlap, 2008) refers to an individual's general beliefs about the relationship between people and the environment. The NEP aims to identify an ecocentric set of beliefs, which refer to the notion that people are part of, and constrained by, the natural world. The NEP was developed in response to the anthropocentric belief system, where people are seen as disconnected from, and even superior to, the natural environment (referred to as the Dominant Social Paradigm). The NEP has become the most widely used measure to assess environmental attitudes (Bernstein & Szuster, 2019; Hawcroft & Milfont, 2010; Hornsey et al., 2016). People who more strongly endorse ecocentric statements in the NEP scale (e.g., "Humans are seriously abusing the environment") are assumed to have a more positive attitude towards the natural environment (i.e. they are assumed to endorse a pro-environmental attitude).

Environmental attitudes, measured by the NEP, are associated with a host of pro-environmental behaviours and beliefs, including energy conservation at home (Karlin et al., 2014), recycling (Vining & Ebreo, 1992), and policy support (Dietz et al., 2007; Steg et al., 2005). Some studies, however, have found no relationships between environmental attitudes and pro-environmental behaviours (e.g., Whitmarsh & O'Neill, 2010). In the New Zealand context, Milfont (2012a) found that the NEP was the strongest predictor of respondents' concern for global warming/climate change as well as their perceived ability to influence global warming/climate change outcomes. Extending prior work, this current study examines the extent to which environmental attitudes, as measured by the NEP, is predictive of beliefs in human-induced climate change and engagement in pro-environmental and nature conservation behaviours.

Trust in science

When people are faced with complex scientific issues, they often use heuristics, or short-cuts to form an opinion about these issues. It has been argued that trust in science is one such heuristic (Lee et al., 2005; Liu & Priest, 2009), and that it is "a form of social or institutional trust, which denotes impersonal trust attributed to people working in institutions – as opposed to personalized trust in a known individual" (Hmielowksi et al., 2014, p. 869). According to a review of research on trust by Chryssochoidis, Strada and Krystallis (2009), trust in institutions is shaped by sociocultural factors as well as by values. If people indeed use trust in science as a heuristic to help inform their views about climate change, then they might be more likely to accept claims of scientists who share the same values (Siegrist et al., 2000; Siegrist & Cvetkovich, 2000).

Notably, trust in science may influence perceptions of scientific issues, such as climate change (Carter & Wiles, 2014; Dunlap & McCright 2011), whereby higher levels of trust in science will likely be associated with a greater belief in human-caused climate change. The research to date seems to support this notion (Arbuckle et al., 2014; Hmielowski et al., 2014; Leiserowitz et al., 2013; Malka et al., 2008; Milfont, 2012b). People with higher levels of trust in science tend to express a higher degree of certainty that climate change is happening and/or that it is caused by human activity.

Socio-demographic predictors

Several studies have found that socio-demographic characteristics are related to climate change beliefs and associated behaviours; including age, gender, ethnicity, income, and education (Dietz et al., 2005; Fisher et al., 2018; Lee et al., 2015; McCright, 2010; Milfont et al., 2015). These relationships tend to be small to modest (for a meta-analysis, see Hornsey et al., 2016). Studies find that female participants express higher levels of concern about climate change and engage more often in pro-environmental behaviours, compared with male participants (e.g., O'Conner et al., 2009; Hornsey et al., 2016; McCright, 2010; Zelezny et al., 2000). Education and income are often found to be positively associated with climate-related beliefs and behaviours (Hornsey et al., 2016). In this study, we explore whether gender, education and income are positively associated with belief in anthropogenic climate change in a New Zealand context as observed previously (e.g., Milfont et al., 2015).

The findings pertaining to the relationship between age and climate-related beliefs and actions appear to be mixed. A study from the US, for example, found that younger people were more likely to believe that climate change is real and that it will have negative consequences (O'Conner et al., 1999). Another US study, however, found that age was positively associated with climate activism (Roser-Renouf et al., 2015). In that study, older

participants were more likely to engage in climate related actions, such as attending climate-related meetings and volunteering with an organization working to reduce global warming. A meta-analysis, however, found that age was negatively associated with belief in anthropogenic climate change, with younger participants expressing stronger beliefs in climate change (Hornsey et al., 2015). Another meta-analysis examined relationships between age and several environmental measures, such as environmental attitudes and pro-environmental behaviours (Wiernik et al., 2013). The study found that most of these relationships were "negligibly small" (p. 826). These small correlations did seem to indicate that older participants were more likely to engage with nature and conserve natural resources. A more recent longitudinal study confirmed the so-called "climate change generation gap", whereby younger people care more about climate change than older people, only in the initial levels of climate beliefs but not in over-time increases in belief levels over the 2009-2018 period (Milfont et al., 2021).

The relationship between ethnicity and perceptions of climate change seems to vary (Dietz et al., 2007; Mohai & Bryant, 1998). This could be because different studies use different ways to categorise ethnicity, or because certain ethnic groups are underrepresented in survey research on climate change issues. In the context of Aotearoa New Zealand, Māori cultural worldviews see people as deeply connected to the natural world, expressed through the notion of kaitiakitanga, or guardianship (Tassell-Matamua et al., 2021). In a te ao Māori worldview, people are intricately linked with nature, and the relationship between people and the natural environment is viewed as reciprocal, rather than people having complete dominion over nature (i.e., an anthropocentric worldview). This worldview cultivates notions about what is appropriate behaviour towards the natural environment, underpinned by tikanga (custom). Research has indeed shown that Māori express greater environmental concern than non-Māori (see Cowie et al., 2016), and that Māori environmental regard is explained by two dimensions of Māori identity: socio-political consciousness and spirituality (Lockhart et al., 2019). The present research explores the climate-related beliefs and behaviours of people who identify as Māori, compared with those who do not identify as Māori.

Overview of and justification for hypotheses

In this study, we compare the predictive ability of psychological variables (values, environmental attitudes, and trust in science) and socio-demographic characteristics (age, gender, ethnicity, education, and income) in a large and nationally representative sample of the New Zealand population. Our hypotheses are informed by the framework depicted in Figure 1 and the literature reviewed above.

H1: With respect to the socio-demographic variables, we expect income and education to be positively and age to be negatively associated with belief in anthropogenic climate change and engagement in pro-environmental and nature conservation behaviours. We further expect that female participants and those who identify as Māori have higher levels of belief in anthropogenic climate change and greater engagement in pro-environmental and conservation behaviours compared with male participants and those who do not identify as Māori.

H2: With respect to the psychological variables, we expect that self-transcendence values, openness to change values, NEP, and trust in science are positively associated with belief in anthropogenic climate change and engagement in pro-environmental and nature conservation behaviours, while associations should be negative for self-enhancement and tradition values.

METHOD

Procedure and Participants

This study uses data from a larger national survey on public opinions of pest control conducted between August 7 and 22, 2017 (see MacDonald et al., 2020). This study focuses on the questions regarding climate-related opinions, beliefs, and behaviours. The survey was completed using the online Colmar Brunton Panel™ which adheres to ISO 20252:2012 certification. Quota targets were set in each New Zealand region to ensure it was broadly representative of the adult population (18 years and over) and the target number of responses was 8,500. The final sample comprised 8,199 respondents, with the majority being New Zealand European (82%), female (55.1%) and 50 years or older (52.7%), having a tertiary diploma/certificate or higher (63.1%), and a self-reported household income of NZ$59,001 or more (55.5%). The composition of the sample is displayed in Table 1 and includes a comparison (where possible) with the New Zealand 2018 Census (please note that not all socio-demographic questions in our survey were measured in the same way as the Census questions).

Materials

Independent variables

Values: We used the 21-item Portrait Value Questionnaire (PVQ) (Schwartz et al., 2001) to measure values. The PVQ has been tested and validated in samples around the world (Krystallis et al., 2008; Verkasalo et al., 2009). The PVQ is based on short statements (portraits) of people, for example, "She strongly believes that people should care for nature. Looking after the environment is important to her." Participants saw either a male, female, or gender neutral ("they") version of each portrait depending on their self-selected gender. Participants were asked to indicate how similar the person in the portrait is to themselves, on a six-item scale anchored at 1 (very much like me) and 6 (not like me at all), and the importance of each value can be inferred from the self-reported similarity (Schwartz et al., 2001). The scores were recoded so that a higher score indicates a stronger endorsement of a particular value, and each scale score was computed by averaging the relevant value items.

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In terms of consistency; the "note" in all tables does not have the same format, it's bold in some, not in others.

Table 1. Sample characteristics in our survey (N = 8,199) compared with the 2018 New Zealand Census.

	Our survey	*2018 Census*		Our survey	*2018 Census*		Our survey	*2018 Census*
Age			*Education*			*Income*		
Under 18	-	24%	None	8%	17%	Loss	1%	0.5%
18 to 24 years	6.6%	9.3%	High school qualification	29%	38.6%	Zero	2.9%	6.8%
25-29 years	7.5%	7.3%	Tertiary diplomas/certificates	33.9%	9.2%	$1 - $5,000	1.3%	5.6%
30-34 years	7.9%	6.8%	Bachelor's degree or higher	29.2%	23.2%	$5,001 - $10,000	1.1%	4.7%
35-39 years	8.4%	6.3%	Overseas qualification	-	5.5%	$10,000 - $15,000	2.2%	6.9%
40-44 years	7.9%	6.2%				$15,001 - $20,000	3.5%	9.9%
45-49 years	8.9%	6.8%	*Ethnicity**			$20,001 - $25,000	6.1%	8.1%
50-54 years	8.9%	6.6%	New Zealand European	82%	70.2%	$25,001 - $30,000	5.6%	5.6%
55-59 years	9.9%	6.4%	Māori	12%	16.5%	$30,001 - $35,000	5.7%	4.9%
60-64 years	8.7%	5.6%	Pacific peoples (Samoan, Tongan,	1.1%	8.1%	$35,001 - $40,000	5.8%	5.6%
65-69 years	10.5%	4.9%	Cook Island Māori, Niuean)			$40,001 - $50,000	9.2%	9.7%
70 years +	14.7%	10.1%	Asian (Chinese, Indian)	3.9%	15.1%	$50,001 - $60,000	9%	8.2%
			Other	8.6%	2.7%	$60,001 - $70,000	9%	6.2%
Gender						$70,001 - $100,000	17.7%	9.6%
Male	44.6%	49%				$100,001 - $150,000	13.4%	4.7%
Female	55.1%	51%				$150,001 or more	6.4%	2.9%
Gender diverse	0.3%	-						

***Note**: Not all percentages add up to 100% as the "prefer not to answer" option is not displayed here. For ethnicity, the numbers do not add up to 100% because participants could choose more than one ethnicity they identified with.

Cronbach's alphas for each of the four value dimensions were: self-transcendence (α = .76), self-enhancement (α = .74), openness to change (α = .69), and tradition (α = .71). These alphas are consistent with a prior New Zealand study (Graham & Abrahamse, 2017) and research from other countries (Schwartz, 2003; Verkasalo et al., 2009). Values are conceptually broad, meaning that measures of values can have lower internal reliability compared with other scales (i.e., α < .80) (Caprara et al., 2006; Schwartz, 2012). In line with Schwartz (2002), we used individual mean centering to correct for the fact that people differ in their use of the response scale. The centred scores were used for the correlation and regression analyses. Mean scores and SDs in Table 2 represent the uncentered scores for ease of interpretation.

*Environmental attitudes***:** Environmental attitudes were measured using the 15-item New Ecological Paradigm (NEP) scale. The NEP scale includes beliefs about human impacts on the environment and humanity's right to rule over nature (Dunlap et al., 2000). The NEP includes statements such as "Humans are seriously abusing the environment" and "Plants and animals have as much right as humans to exist" , "Humans have the right to modify the natural environment to suit their needs" (reverse coded) and "The Earth has plenty of natural resources if we just learn how to develop them" (reverse coded). Participants were asked to indicate their level of agreement to each statement on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). After reverse coding relevant items, the scale score was computed by averaging over items so that a higher score reflects a more positive attitude toward the environment (i.e., a stronger endorsement of ecocentric statements). The NEP scale had good internal validity in our sample: α = .84.

Trust in science: We used the 6-item trust in science scale developed by Nadelson and colleagues (2014). The items are: "Scientists ignore evidence that contradicts their work" (reverse coded), "Scientific theories are weak explanations" (reverse coded), "We can trust science to find the answers that explain the natural world", "Today's scientists will sacrifice the well-being of others to advance their research" (reverse coded), "We should trust that scientists are being ethical in their work", and "Scientists are free from political interference". Participants were asked to rate these statements on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). After reverse coding relevant items, the scale score was computed by averaging over items so that a higher score reflects higher levels of trust in science (α = .72).

Socio-demographic variables: We included age, gender, ethnicity, education levels and income in the correlation and regression analyses. Age was measured in age categories and these were coded from 1 (18 to 24 years) to 11 (70 years or over). Gender was coded as 1 (male) and 2 (female); for the purpose of the analyses participants who identified as gender diverse were not included as they comprised too small a category (0.3% of the sample, or n = 21) to make meaningful comparisons. Participants were able to select more than one ethnicity they identified with. For the purpose of the analyses, ethnicity was dummy coded as 1 (identifies as Māori; 12.4%, n = 1,015) or 2 (does not identify as Māori; 87.6%, n = 7,184). We used the Māori/non-Māori binary for practical and conceptual reasons. Practically, the percentage of other ethnicities in our sample was relatively small (too small to make meaningful comparisons). Conceptually, using a binary is in line with other New Zealand and international research on belief in anthropogenic climate change. For example, in their meta-

Table 2. Means, standard deviations, Cronbach's alpha and correlations (with 95% Confidence Intervals in brackets) between the independent variables.

	M	SD	α	Self-enhancement	Self-transcendence	Openness to change	Tradition	Environmental attitude
Self-enhancement values	3.2	.87	.74					
Self-transcendence values	4.5	.78	.76	-.65** [-.66; -.63]				
Openness to change values	3.9	.87	.69	-.05** [-.07; -.02]	-.05** [-.07; -.03]			
Tradition values	3.8	.82	.71	-.43** [-.44; -.41]	-.15** [-.17; -.13]	-.63** [-.64; -.61]		
Environmental attitude	4.9	.83	.84	-.22** [-.25; -.20]	.37** [.35; .39]	.10** [.08; .12]	-.16** [-.18; -.13]	
Trust in science	4.0	.88	.72	.10** [.08; .13]	-.03* [-.05; -.01]	-.06** [-.09; -.04]	-.04** [-.06; -.01]	-.05** [-.07; -.02]

Note: Values measured on a scale from 1 (not at all like me) – 6 (very much like me); Environmental attitude and trust in science '1' (strongly disagree) to '7' (strongly agree). For the correlations, the centered values were used (Schwartz, 2012). N = 8178.

analysis on the correlates of belief in climate change, Hornsey et al. (2016) use the binary 'White' and 'Non-Whites' to denote ethnicity. In New Zealand, Cowie et al. (2016) and Lockhart et al. (2019) compared Māori with other ethnic groups. Education was coded as 1 (none), 2 (high school qualification), 3 (tertiary diploma, certificates) and 4 (bachelor's degree or higher). Income was measured via income categories that ranged from 1 (loss), 2 (zero), 3 ($1 –$5,000) up to 16 ($150,001 or more).

Dependent variables

*Belief in anthropogenic climate change***:** The survey included a single-item measure asking participants to indicate their opinion about the causes of climate change, which was based on prior research (Fisher et al., 2018; Hornsey et al., 2018). The six response options were coded as follows: 1: "Entirely caused by natural processes", 2: "Mainly caused by natural processes", 3: "Partly natural processes and partly human activity", 4: "Mainly caused by human activity", 5: "Entirely caused by human activity", and 6: "There is no such thing as climate change". Of the overall sample, 10% claimed that climate change is 'entirely' or 'mainly' caused by natural processes and 39% maintained that climate change was caused partly by natural processes and partly by human activity, whereas 48.2% of the sample said that climate change is 'mainly' (37.3%) or 'entirely' (10.9%) caused by human activity. Only 2.8% of participants chose the option 'There is no such thing as climate change'. Following the approach taken by Hornsey, Harris and Fielding (2018), we treated answers to this question as a continuous measure of belief in climate change and we coded participants who chose 'there is no such thing as climate change' as "1". A higher score indicated greater belief in anthropogenic climate change. (Please note data on this question was used in an unrelated publication by Milfont et al, 2021.)

*Pro-environmental and nature conservation behaviours***:** The survey asked about three pro-environmental behaviours and three nature conservation behaviours. We based these behavioural questions on the "Public perceptions of New Zealand's environment survey" conducted by Hughey et al. (2016). People were asked to indicate how often they engaged in each behaviour, on a 7-point scale that ranged from 1 (every week), 2 (every 2-3 weeks), 3 (about once a month), 4 (every 2-3 months), 5 (about once a year), 6 (less than once a year), to 7 (never). These behaviours were: (i) Car pool or use public transport, and (ii) Compost organic waste, (iii) Help clean local beaches, rivers, or streams, (iv) Choosing native plants to have in my home, (v) Recycling my glass, paper and cans, and (vi) Trapping or controlling rats, stoats and/or possums. Scores were recoded so that a higher score reflects a higher frequency of engaging in the behaviour. Since these items assess broad and distinct domains (as confirmed by low Cronbach's alpha's of .57 and .44), we did not attempt to construct composite measures and instead examined their individual associations with the other measures.

RESULTS

Correlations

The bivariate correlations between the variables are displayed in Table 3. Following the recommendation by Schwartz (2012), we present the correlations between the centered values and the outcome variables. Belief in anthropogenic climate change was most strongly and positively associated with environmental attitudes, as measured by the NEP scale (r = .41; 95% CI [.40, .44]), followed by self-transcendence values (r = .14; 95% CI [.11, .16]) and trust in science (r = .08; 95% CI [.06, .11]). In contrast, people with stronger tradition values were less likely to believe in anthropogenic climate change (r = -.10; 95% CI [-.12, -.08]). Women (r = .07; 95% CI [.05, .10]), younger participants (r = -.16; 95% CI [-.19, -.14]), participants who identified as Māori (r = .08; 95% CI [.06, .11]), people with higher education levels (r = .11; 95% CI [.09, .14]) and higher income levels (r = .04; 95% CI [.02, .07]) were more likely to believe in anthropogenic climate change.

All six behaviours were positively associated with education, with correlations ranging from r = .07 to r = .16. Age was associated with five of the behaviours and most strongly with the use of carpooling or public transport, with younger participants more likely to engage in this behaviour (r = -.25; 95% CI [-.28, -.23]). Female participants were likely to engage more frequently in recycling (r = .04; 95% CI [.02, .07]) and less frequently in trapping (r = -.10; 95% CI [-.13, -.08]), and beach clean-ups (r = -.03; 95% CI [-.05, -.01]) compared with male participants. Participants who identified as Māori were more likely to participate in beach clean ups (r = .07; 95% CI [.05, .10]) and carpool or use public transport (r = .04; 95% CI [.01, .06]) compared with non-Māori. Of the psychological variables, environmental attitude (NEP) was positively associated with most pro-environmental behaviours and most strongly with composting (r = .13; 95% CI [.11, .15]) and recycling (r = .12; 95% CI [.10, .14]). Self-transcendence vales were most strongly related to composting (r = .14; 95% CI [.12, .16]) and recycling (r = .11; 95% CI [.09, .14]). Self-enhancement values were negatively related to composting (r = -.14; 95% CI [-.16, -.12]) and positively related to the use of carpooling or public transport (r = .08; 95% CI [.05, .10]). Openness to change values were positively associated with the three nature conservation behaviours (r = .10 to r = .14), whereas tradition values were negatively associated with these behaviours (r = -14 to r = -.07).

Regression results

Predictors of beliefs in anthropogenic climate change were examined via two steps. First, socio-demographic variables were entered in the regression model, followed by the psychological variables: values, NEP, and trust in science (see Table 4). Socio-demographic variables accounted for 4% of the variance in climate change beliefs: R = .21, R^2 = .04, F (5, 8172) = 74.16, p < .001. When the other socio-demographic variables were controlled for, age was the strongest predictor (β = -.14, 95% CI [-.15, -.11], t = -12.20, p < .001), suggesting that younger participants expressed stronger beliefs in anthropogenic climate change compared with older

Table 3. Means, standard deviations and the correlations (and 95% CI in brackets) between dependent and independent variables.

	Belief in climate change	Recycling	Composting	Carpool or public transport	Native plants	Trapping	Beach clean-ups
Mean (SD)	3.4 (.97)	6.5 (1.25)	4.4 (2.60)	3.1 (2.14)	2.7 (1.58)	2.1 (1.79)	2.0 (1.43)
Age	-.16**	.03**	.15**	-.25**	.04**	.00	-.09**
	[-.19, -.14]	[.01, .06]	[.13, .17]	[-.28, -.23]	[.02, .06]	[-.02, .02]	[-.11, -.06]
Gender	.07**	.04**	-.02*	.00	-.01	-.10**	-.03**
	[.05, .10]	[.02, .07]	[-.04, .00]	[-.02, .02]	[-.03, .02]	[-.13, -.08]	[-.05, -.01]
Identify as Māori	.08**	.02	-.03**	.04**	-.01	-.01	.07**
	[.06, .11]	[-.01, .04]	[-.05, -.01]	[.01, .06]	[-.03, .01]	[-.03, .02]	[.05, .10]
Education	.11**	.07**	.10**	.16**	.14**	.07**	.11**
	[.09, .14]	[.04, .09]	[.08, .12]	[.14, .19]	[.12, .16]	[.05, .09]	[.09, .14]
Income	.04**	.05**	.02	.02	.06**	.04**	.00
	[.02, .07]	[.03, .08]	[-.001, .04]	[.00 .04]	[.04, .08]	[.02, .06]	[-.02, .02]
Self-enhancement values	-.01	-.06**	-.14**	.08**	-.04**	.00	.01
	[-.04, .01]	[-.08, -.04]	[-.16, -.12]	[.05, .10]	[-.06, -.02]	[-.02, .03]	[-.01, .03]
Self-transcendence values	.14**	.11**	.14**	.01	.07**	-.02	.04**
	[.11, .16]	[.09, .14]	[.12, .16]	[-.02, .03]	[.05, .09]	[-.04, .00]	[.02, .06]
Openness to change values	.00	-.01	.09**	.05**	.10**	.12**	.14**
	[-.02, .02]	[-.03, .01]	[.07, .11]	[.04, .08]	[.08, .12]	[.10, .15]	[.12, .16]
Tradition values	-.10**	-.03**	-.05**	-.12**	-.09**	-.07**	-.14**
	[-.12, -.08]	[-.05, -.01]	[-.07, -.02]	[-.14, -.10]	[-.12, -.07]	[-.10, -.05]	[-.16, -.12]
Environmental attitude	.42**	.12**	.13**	.04**	.09**	.01	.06**
	[.40, .44]	[.10, .14]	[.11, .15]	[.02, .06]	[.07, .11]	[-.01, .03]	[.04, .08]
Trust in science	.08**	.02	-.02*	.07**	.02	-.03*	.00
	[.06, .11]	[.00, .04]	[-.04, .00]	[.04, .09]	[.00 .04]	[-.05, .00]	[-.03, .02]

Note: Values measured on a scale from 1 (not at all like me) – 6 (very much like me); Environmental attitude and trust in science '1' (strongly disagree) to '7' (strongly agree), climate change beliefs 1 (climate change) mainly caused by natural causes - 5 (mainly caused by human activity), and pro-environmental behaviours '1' (never) to '7' (almost always). *N* = 8178; ** p < .01, * p <.05

participants. People with higher education levels (β = .09, 95% CI [.07, .11], t = 8.26, p < .001), people who identified as female (β = .06, 95% CI [.03, .08], t = 5.22, p < .001), and those who identified as Māori (β = .07, 95% CI [.05, .09], t = 6.55, p < .001) expressed stronger beliefs in anthropogenic climate change than their counterparts. These results confirm our first hypothesis. In contrast to expectations, however, income was unrelated to climate change beliefs.

At step 2, the psychological variables explained an additional 17% of the variance: R = .46, R^2 = .21, R^2_{change} = .17, F_{change} (6, 8164) = 296.02, p < .001. Our findings broadly confirm our second hypothesis. Of the psychological variables, environmental attitude was the strongest predictor. People with more positive environmental attitudes, as measured by the NEP, expressed a stronger belief in anthropogenic climate change (β = .41, 95% CI [.38, .42], t = 38.30, p < .001). People with higher levels of trust in science were more likely to believe in anthropogenic climate change (β = .09, 95% CI [.07, .11], t = 9.12, p < .001), as were those who place greater importance on self-transcendence values (β = .03, 95% CI [.02; .05], t = 2.20, p < .05). In contrast to our hypothesis, openness to change values were negatively associated with belief in climate change (β = -.06, 95% CI [-.09, -.04], t = -5.11, p < .001). Tradition values were unrelated to climate change beliefs. Also surprisingly and in contrast to our hypothesis, belief in anthropogenic climate change was positively associated with self-enhancement values (ß = .06, 95% CI [.03, .08]t = 4.35, p < .001). Given that self-enhancement values were not significantly correlated with belief in climate change (r =- 0.01, p > .05), and not able to predict belief in climate change as a single predictor (β = -.01, t = -1.16, p > .05), it is likely that self-enhancement values act as a suppressor variable (see Ludlow & Klein, 2014; Smith, Ager & Williams, 1992). While self-enhancement values are unrelated to belief in climate change, when added in a regression model, these values seem to enhance the predictive ability of the other variables.

Overall, the psychological variables explained a larger proportion of explained variance in belief in anthropogenic climate change compared with the socio-demographic variables. Taken together, the socio-demographic and psychological variables explained 21% of the variance in belief in climate change (R = .45, R^2 = .21, F(11, 8166) = 193.44, p < .001).

When the psychological variables were added, the relationship between gender and belief in anthropogenic climate change was no longer statistically significant, pointing to possible mediation. Based on the bivariate correlations (see Table 3), we focused the exploratory mediation analysis on self-transcendence and tradition values. We examined whether self-transcendence and tradition values mediate the gender difference in belief in climate change with a parallel mediation model using PROCESS model 4, using 5,000 bootstrap samples (Hayes, 2019). Gender had a direct association with climate change beliefs, with women showing stronger belief in human-induced climate change compared with men (B = .09, p = .001, 95% CI [.04, .13]). Gender also had a significant total indirect effect on climate change beliefs via the mediators (B = .06, 95% CI [.05, -.07]). Both self-transcendence values (B = .07, 95% CI [.06, .08]) and tradition values (B = -.008, 95% CI [-.013, -.005]) were reliable mediators of the observed gender difference in climate change beliefs.

Predictors of engagement in pro-environmental behaviours

The predictors of engagement in three pro-environmental behaviours were examined via linear regression and included the socio-demographic variables and the psychological variables (this now also includes belief in anthropogenic climate change). The results are displayed in Table 5.

Of the pro-environmental behaviours, people most often engaged in recycling (see Table 3). Only 3% of the variance in recycling was explained by the socio-demographic and psychological variables: R = .19, R^2 = .03, F(12, 8165) = 24.13, p < .001. Self-transcendence values were the strongest predictor of recycling (β = .11, 95% CI [.08, .15], t = 7.81, p < .001) when the other variables were controlled for. NEP (β = .06, 95% CI [.03, .09], t = 4.47, p < .001) and belief in anthropogenic climate change (β = .05, 95% CI [.02, .08], t = 4.00, p < .001) were also positively related to recycling. People

Table 4. Standardised regression weights, confidence intervals and t-values for predictors of belief in anthropogenic climate change (N = 8178).

	Model 1 Socio-demographic variables only		Model 2: Psychological variables added	
	Beta [95% CI]	t-value	Beta [95% CI]	t-value
Age	-.14 [-.15, -.11]	-12.20***	-.14 [-.15, -.11]	-12.62***
Gender	.06 [.03, .08]	5.23***	.01 [-.01, .03]	.82
Identify as Māori	.07 [.05, .09]	6.55***	.05 [.03, .07]	5.10***
Education	.09 [.07, .11]	.26***	.03 [.01, .05]	2.85**
Income	.01 [-.01, .03]	.69	.00 [-.02, .02]	.19
Self-transcendence values	--		.03 [.02; .05]	2.20*
Self-enhancement values	--		.06 [.03, .08]	4.35***
Openness to change values	--		-.06 [-.09, -.04]	-5.11***
Tradition values	--		-.01 [-.03, .01]	-1.16
Environmental attitude	--		.41 [.38, .42]	38.30***
Trust in science	--		.09 [.07, .11]	9.12***
R	.21		.46	
R^2	.04		.21	
R^2_{change}	.04		.17	
F_{change}	74.16***		296.02***	

Note: * p <.05; ** p < .01; *** p < .001

Table 5. Socio-demographic and psychological predictors of pro-environmental behaviours (PEBs) and nature conservation behaviours.

	Pro-environmental behaviours						**Nature conservation behaviours**					
	Recycling		Composting		Carpool/public transport		Native plants at home		Trapping		Beach cleanup	
	Beta [5% CI]	*t*	Beta [95% CI]	*t*	Beta [95% CI]	*t*	Beta [95% CI]	*t*	Beta [95% CI]	*t*	Beta [95% CI]	*t*
Age	.07 [.04, .09]	5.44***	.15 [.13, .17]	12.85***	-.21 [-.24, -.19]	-18.27***	.07 [.05, .10]	6.16***	.01 [-.02, .03]	.50	-.05 [-.07,-.02]	-4.16***
Gender	.02 [-.00, .05]	2.00*	-.04 [-.06, -.02]	-3.41**	-.03 [-.05, -.01]	-3.04**	-.01 [-.04, .01]	-1.20	-.10 [-.12, -.08]	-9.07***	-.05 [-.08, -.03]	-4.73***
Identify as Māori	.01 [-.01, .03]	1.02	-.03 [-.05, .00]	-2.30*	.01 [-.01, .04]	1.11	-.01 [-.03, .02]	-.80	-.01 [-.03, .02]	-.51	.06 [.03, .08]	5.15***
Education	.04 [.01, .06]	3.14**	.10 [.08, .12]	8.76***	.12 [.10, .14]	10.56***	.12 [.09, .14]	9.89***	.06 [.03, .08]	4.86***	.10 [.07, .12]	8.25***
Income	.05 [.03, .07]	4.26***	.01 [-.01, .04]	.96	-.05 [-.07, -.03]	-4.24***	.04 [.01, .06]	3.08**	.03 [.00, .05]	2.20*	-.03 [-.05, -.01]	-2.64**
Self-transcendence	.11 [.08, .15]	7.81***	.08 [.06, .11]	5.98***	.08 [.05, .10]	5.53***	.07 [.04, .09]	4.66***	-.01 [-.04, .01]	-.87	.07 [.04, .10]	4.95***
Self-enhancement	.02 [-.01, .05]	1.25	-.09 [-.11,-.06]	-6.15***	.03 [.00, .06]	2.14*	-.01 [-.03, .02]	-.37	-.04 [-.06, -.01]	-2.65**	-.00 [-.03, .03]	-.18
Openness to change	-.02 [-.05, .01]	-1.35	.10 [.07, .12]	6.97***	.04 [.02, .07]	3.18**	.10 [.07, .13]	7.24***	.14 [.12, .17]	10.29***	.13 [.10, .16]	9.53***
Tradition	-.01 [-.03, .02]	-.66	-.03 [-.05,-.01]	-2.52*	-.03 [-.05, -.01]	-2.28*	-.04 [-.06,-.02]	-3.25**	-.02 [-.05, .00]	-1.72	-.06 [-.09, -.04]	-5.13***
Environmental attitude	.06 [.03, .09]	4.48***	.08 [.06, .11]	6.31***	-.03 [-.05, .00]	-2.09*	.05 [.02, .07]	3.59***	.01 [-.02, .03]	.35	.00 [-.02, .03]	.15
Trust in science	.01 [-.01, .03]	1.01	-.02 [-.04, .00]	-2.00*	.04 [.02, .06]	3.58***	.01 [-.01, .03]	.78	-.03 [-.05, -.01]	-2.51*	-.01 [-.03, .01]	-1.10
Belief in climate change	.05 [.02, .08]	4.00***	-.01 [-.03, .01]	-.87	.05 [.03, .07]	4.34***	-.01 [-.03, .02]	-.67	-.03 [-.05, .00]	-2.12*	.02 [-.01, .05]	1.26
R	.19		.27		.31		.21		.18		.23	
R^2	.03		.07		.10		.05		.03		.05	
F	24.13***		51.68***		73.50***		31.97***		23.02***		38.55***	

Note: * p <.05; ** p < .01; *** p < .001

with higher education levels (β = .04, 95% CI [.01, .06], t = 3.14, p < .01), older participants (β = .07, 95% CI [.04, .09], t = 5.44, p < .001), and people with higher incomes (β = .05, 95% CI [.03, .07], t = 4.26, p < .001) recycled more often compared to their counterparts.

The socio-demographic and psychological variables were able to explain 7% of the variance in composting: R = .27, R^2 = .07, F (12, 8165) = 51.68, p < .001. The strongest predictor of composting behaviour was age. Older participants were more likely to engage in composting compared with younger participants (β = .15, 95% CI [.13, .17], t = 12.85, p < .001) and female participants were less likely to engage in composting compared with male participants (β = -.04, 95% CI [-.06, -.02], t = -3.41, p < .01). People with higher education levels were more likely to engage in composting (β = .10, 95% CI [.08, .12], t = 8.76, p < .001). The other socio-demographic variables did not significantly predict composting behaviour. All psychological variables were associated with composting, except for belief in climate change. Openness to change values (β = .10, 95% CI [.07, .12], t = 6.97, p < .001) was the strongest psychological predictor, indicating that people who more strongly endorsed openness to change were more likely to engage in composting.

A total of 10% of the variance in the uptake of carpooling or public transport use was accounted for by the socio-demographic and psychological variables: R = .31, R^2 = .10, F (12, 8165) = 73.50, p < .001. Age was the strongest predictor: younger people were more likely to carpool or use public transport (β = -.21, 95% CI [-.24, -.19], t = -18.27, p < .001) compared with older people. Higher education levels (β = .12, 95% CI [.10, .14], t = 10.56, p < .001), a stronger endorsement of self-transcendence values (β = .08, 95% CI [.05, .10], t = 5.53, p < .001) and a stronger belief in anthropogenic climate change (β = .05, 95% CI [.03, .07], t = 4.34, p < .001) were associated with a more frequent uptake of carpooling or public transport.

Predictors of engagement in nature conservation behaviours

Table 5 also displays linear regression results for the three nature conservation behaviours. The socio-demographic and psychological variables explained 5% of the variance in having native plants at home: R = .21, R^2 = .05, F (12, 8165) = 31.97, p < .001. Higher education levels (β = 12, 95% CI [.09, .14], t = 9.89, p < .001), a stronger endorsement of openness to change values (β = .10, 95% CI [.07, .13], t = 7.24, p < .001) and of self-transcendence values (β = .07, 95% CI [.04, .09], t = 4.66, p < .001) were associated with a greater likelihood of having native plants at home, when the other variables were controlled for.

The socio-demographic and psychological variables accounted for 3% of the variance in trapping: R = .18, R^2 = .03, F (12, 8165) = 23.02, p < .001. Openness to change values were most strongly and positively associated with trapping (β = .14, 95% CI [.12, .17], t = 10.29, p < .001), followed by gender and education. Male participants (β = -.10, 95% CI [-.12, -.08], t = -9.07, p < .001) and people with higher education levels (β = 06, 95% CI [.03, .08], t = 5.34, p < .001) were more likely to engage in trapping.

Some 5% of the variance in taking part in beach clean-ups was explained by the socio-demographic and psychological variables: R = .23, R^2 = .05, F (12, 8165) = 38.53, p < .001, Openness to change values were the strongest predictor. People who more strongly endorsed openness to change values were more likely to take part in beach clean-ups (β = .13, 95% CI [.10, .16], t = 9.53, p < .001). People with higher education levels (β = .10, 95% CI [.07, .12], t = 10.26, p < .001) and people who more strongly endorsed self-transcendence values (β = .07, 95% CI [.04, .10], t = 4.95, p < .001) were also more likely to take part in beach clean-ups. Tradition values (β = -.07, 95% CI [-.09, -.04], t = -5.13, p < .001), in contrast, were negatively associated with taking part in beach clean-ups.

DISCUSSION

This study represents one of the first explorations of socio-demographic and psychological predictors of belief in anthropogenic climate change in a large and representative sample of the New Zealand population. In addition, this study is one of the first to explore the extent to which belief in anthropogenic climate change is associated with engagement in a set of pro-environmental and conservation behaviours. We used a modified version of the theoretical framework proposed by Dietz et al. (2007), where pro-environmental behaviours are guided by behaviour-specific beliefs, and we included belief in climate change, environmental attitudes, trust in science, and values to assess the antecedents of behaviour as proposed in the framework (see Figure 1). We did not test the complete model, including all the mediating relationships proposed, which has already been documented elsewhere (e.g., see Dietz et al., 2007; Steg et al., 2005). Here, we focus on those mediating relationships that emerged in the regression results.

We find that in our New Zealand sample, there is no clear consensus on climate change. Indeed, only 48% of the sample believed that climate change was caused mainly or entirely by human activity. This is broadly in line with research from the UK (Fisher et al., 2018) and Australia (Hornsey et al., 2018). The scientific consensus on climate change is evident; public opinion, however, appears divided – also in New Zealand. This suggests, perhaps, that climate scientists might need to explore different ways of communicating the science of climate change to the public (e.g., Moser & Dilling, 2011).

When examining the predictors of belief in anthropogenic climate change, our findings are broadly in line with our hypotheses. Environmental attitude was—by far—the strongest predictor of belief in anthropogenic climate change, when the other variables were controlled for. This finding corresponds to previous work in other countries, such as the US (Dietz et al., 2005; Hornsey et al., 2016). Self-transcendence values were positively and tradition values were negatively associated with belief in anthropogenic climate change, but values were less strongly associated with belief in anthropogenic climate change compared with environmental attitudes. This is in line with the results of the meta-analysis of the correlates of belief in climate change by Hornsey et al. (2016), and supports Homer and Kahle's (1988) cognitive hierarchy model suggesting that values are more distal predictors of

behaviours compared to attitudes (see also Milfont et al., 2010).

Our analyses broadly confirm our first hypothesis. Age was the strongest socio-demographic predictor of climate change belief, with younger New Zealanders expressing a stronger belief in human-induced climate change. This seems to corroborate some prior work (Fisher et al., 2018), but contradicts other work (e.g., Reser-Renouf et al., 2014). People who identified as Māori were more likely to believe in anthropogenic climate change, compared to those who did not identify as Māori as also observed previously (Milfont et al., 2015). We also found that females were more likely to believe in anthropogenic climate change compared with men, and this relationship was mediated by self-transcendence values and tradition values. This finding extends prior work examining psychological variables that can explain gender differences in the environmental domain, including hierarchical ideologies (Milfont & Sibley, 2016) and personality traits (Desrochers et al., 2019). Here we show that women tend to display greater belief in anthropogenic climate change because they more strongly endorsed self-transcendence values and less strongly endorsed tradition values, when compared to men. However, the predictive ability of socio-demographic variables was relatively small compared with psychological variables. Some researchers have suggested that concern about environmental issues has become so prevalent that socio-demographic characteristics are no longer of great importance (e.g., Driscoll, 2019).

In line with our hypothesis, we found that age, education levels, self-transcendence values and environmental attitudes are important predictors of the three pro-environmental behaviours (i.e., recycling, composting, and the uptake of carpooling or public transport). The predictors of people's engagement in nature conservation behaviours were education and openness to change values. Prior research by Hughey et al. (2016) and Kerr et al. (2016) found that people who identify as Māori were more likely to engage in pro-environmental behaviours compared with people who do not identify as Māori. Our study did not confirm these previous findings. This could be in part explained by the fact that we used a different set of socio-demographic predictors and a more comprehensive set of psychological predictors in our regression analysis. Hughey et al. (2016) examined the role of ethnicity in isolation and Kerr et al. (2016) examined socio-demographic predictors plus values and NEP.

Belief in anthropogenic climate change was (positively) associated with two pro-environmental behaviours (recycling and the uptake of carpooling and public transport) and one nature conservation behaviour (trapping). Our study is correlational and this precludes us from making claims about causation. While we find that people with a stronger belief in anthropogenic climate change tend to engage more often in some pro-environmental and nature conservation behaviours, we do not know whether people's belief in climate change *causes* them to engage in these behaviours. This is an important area for further research. Longitudinal studies could examine the extent to which climate-related beliefs have an impact on people's engagement in climate mitigation behaviours over time.

The predictors from the conceptual framework explained a relatively small proportion of the variance in behaviours. There are several explanations for this. People might engage in pro-environmental and nature conservation behaviours for a variety of reasons—not all of these were captured in our conceptual framework. For example, people might start carpooling or use public transport to help ease congestion, or because it is cheaper (Abrahamse & Keall, 2012), or people might start recycling or composting out of a desire to avoid wasting resources (Evans & Abrahamse, 2009). The low correlations between socio-demographic and psychological variables and the outcome variables may also reflect the presence of important barriers, both internal (e.g., lack of knowledge) or external (e.g., lack of access to certain infrastructure and amenities). Understanding these barriers and how interventions can best overcome these barriers is critical to changing behaviour (Schultz, 2014). Another explanation could be that some of the concepts, such as values and the NEP, are quite broad in scope. This has the advantage that these concepts are an efficient way to capture important beliefs (such as self-transcendence values and environmental attitudes) that guide various pro-environmental behaviours (see De Groot & Steg, 2010). However, such broad concepts may not be strongly associated with specific behaviours (Ajzen, 1991; Epstein, 1983). Given that values are guiding principles in people's lives, they may influence people's behaviours indirectly via attitudes and beliefs (e.g., see Milfont et al., 2010). Some research findings suggest that values can guide behavioural choices when these values are made salient; for example, an environmental campaign that emphasises self-transcendence values may encourage people to act in line with these values (Dixon et al., 2017; Evans et al., 2013). Values might therefore be a useful variable to target as part of behaviour change policies and interventions.

We acknowledge that using a binary to explore the relationship between ethnicity and climate change beliefs is limiting. However, in the present study, a direct comparison of ethnicities other than Māori and non-Māori was hindered by the fact that the percentage of people who identified with ethnicities other than Pākehā or Māori in our sample were too small to make meaningful comparisons (see Table 1). Moreover, binary comparisons is in line with prior research on belief in anthropogenic climate change. For example, in their meta-analysis on the correlates of belief in climate change, Hornsey et al. (2016) use the binary 'Whites' and 'Non-Whites' to denote ethnicity. To the best of our knowledge, study findings comparing different ethnic groups in New Zealand seem inconsistent, at least when examining broad environmental worldviews. For example, Lovelock et al. (2013) found that all participants in their study endorsed an ecocentric view (as measured by the NEP) regardless of their ethnicity, while Kerr et al. (2016) did find differences in NEP scores between different ethnic groups and Cowie et al. (2016) observed that Māori place greater emphasis on environmental values than non-Māori.

A final limitation of our study is that we included a small set of pro-environmental and nature conservation

behaviours. This was due to the fact that the work was part of a larger survey on people's perceptions of pest control (MacDonald et al., 2020) and space in the survey was limited. We also acknowledge that the set of pro-environmental behaviours is incomplete in important ways and this limits the applicability of our findings to a wide range of pro-environmental behaviours. We were not able to account for the ways in which the context in which people undertake these behaviours would have influenced people's responses. Somebody living in a rural area, for example, would not necessarily have the same level of access to public transport as somebody living in an urban area. It is likely that structural factors (such as access to carpooling in cities) may have influenced how people responded to the behavioural questions. We did not have detailed data on whether people lived in a city centre, a suburb, or in a rural area. Therefore it was not possible to assess how structural factors (such as access, or the amenities that are available where people live) might have related to people's responses. In terms of the nature conservation behaviours, it would have been useful to include more behaviour-specific beliefs and perceptions. For example, a study found that people's perceptions of litter on beaches was a key driver of their willingness to take part in beach clean-ups (Adam, 2021). Public engagement with trapping and other pest control behaviour are often driven by (local) education initiatives and grassroots movements (e.g., Dinica, 2018; Macdonald et al., 2020; Peltzer et al., 2019). Future work could include other pro-environmental behaviours, such as adopting plant-based diets, reducing in-home energy consumption, or limiting air travel, and focus more on the role of local context in shaping people's engagement in pro-environmental behaviours, thereby extending the scope of our investigation.

Our findings have some clear implications for climate science communication. Our findings seem to confirm that in Aotearoa New Zealand there is a disconnect between the scientific consensus on climate change and public opinion. One way to enhance the effect of climate science communication could be to appeal to people's environmental attitudes, as this was by far the strongest predictor of belief in climate change. Another approach could be to strengthen people's trust in science, as this was a predictor of belief in anthropogenic climate change as well. When people are more likely to trust climate science (and climate scientists), they may be more likely to accept that human activity is causing climate change. Ultimately, when it comes to encouraging climate action, it seems important to consider the psychological and socio-demographic predictors of belief in anthropogenic climate change. It is important to better understand why people believe (or don't believe) in anthropogenic climate change, because this can provide insight into how to best design climate-related campaigns and policies to effectively address the climate challenges that still lie ahead.

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Corresponding author
Wokje Abrahamse
E-mail: wokje.abrahamse@vuw.ac.nz