Segmenting urban populations for greater conservation gains: A new approach targeting cobenefits is required

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Abstract
Engaging urban residents in greater proconservation behaviors is essential to mitigate the biodiversity crisis. To date, most behavior-change campaigns have been based on a one-size-fits-all “think-care-act” approach resulting in insufficient, sometimes counterproductive, conservation gains. In our study, we assess the “think-care-act” paradigm and also consider a range of cobenefits that may motivate different segments of urban populations to take greater conservation action for reasons other than biodiversity gains. We surveyed a representative sample of Auckland, New Zealand (n = 2,124) and four clusters emerged through clustering analysis. The first segment (Environmentally Active; 32%), exhibited the “think-care-act” paradigm. The second segment (Well Informed; 28%), was highly knowledgeable and concerned about conservation problems but exhibited lower conservation behaviors. The third segment (Active Outdoors; 19%) was actively engaged in outdoor activities, but exhibited low conservation knowledge, concern, and behaviors. The fourth segment (Socially Motivated; 21%), demonstrated high levels of conservation behaviors but lower knowledge and concern about conservation issues. We discuss potential ways to engage with each segment based on cobenefits and the need to move away from the traditional “think-care-act” paradigm and instead work with existing values systems and foster greater conservation behavior based on existing cobenefits.

KEYWORDS
audience segmentation, behavior change, cluster analysis, conservation behavior, environmental attitudes, psychographics, science communication, social marketing, social science

1 | INTRODUCTION

Over the last decade, there has been growing recognition of the role of social science research in understanding public engagement in conservation and thus influencing conservation behaviors (Bennett et al., 2017). However, more social science research focused on understanding urban populations and how to facilitate change in urban residents is needed, as urban populations are key drivers of resource use and environmental change globally (Seto, Güneralp, & Hutrya, 2012). Urban
residents can affect large-scale conservation gains as the sum of their individual actions can produce large collective gains (Vestergren, Drury, & Chiriac, 2018); they comprise a major voting block and can support large-scale conservation policies (Kahn & Matsusaka, 1997); and they have substantial consumer power, with associated potential for both positive and negative conservation impacts (Khare, 2015).

However, the urban public is not a homogenous group and campaigns that are broad based, often designed to elicit empathy for the planet, have been ineffective in mitigating biodiversity decline (Schultz, 2011). Instead, segmenting the urban population based on a range of beliefs and values, not necessarily restricted to environmental and conversation beliefs and values, may be more effective to increase conservation action in urban populations (McLeod, Hine, Please, & Driver, 2015). Segmentation has been widely applied in public health (Walsh, Hassan, Shiu, Andrews, & Hastings, 2010), climate change (Hine et al., 2014; Leiserowitz et al., 2011), and the wider environmental field (Oliver & Rosen, 2010; Tabi, Hille, & Wüstenhagen, 2014) but has been underutilized in conservation (Veríssimo et al., 2018).

Segmentation aims to identify subgroups in the population that cluster together based on shared values and beliefs, with members of each segment being more similar to each other than members of other segments (Slater, 1996). The motivations and values relevant to each segment are identified and then targeted to increase engagement with each segment (Maibach, 1993). Segmentation has a long history in consumer marketing and its application toward engaging the public in science and the environment has been significantly advanced due to the scholarship on climate change communication, which has focused on value-based segmentation (Leiserowitz et al., 2011).

Compared to segmentations based on standard demographics such as age, gender, or income, segmenting the targeted audience based on a range of values and beliefs is more effective at predicting overall scientific attitudes and environmental behaviors (Cormick & Romanach, 2014). Another advantage of value-based segmentation is that it recognizes that members of each segment may be driven to engage in an action that has biodiversity benefits but for a range of reasons other than biodiversity outcomes, generally described as cobenefits, for example, economic advantages, health and well-being, or pollution reduction (Bain et al., 2016; McKenzie-Mohr, 2000). By identifying the cobenefits, campaigns can frame the messages to ensure they better align with each segment’s underlying values, making the messages more impactful (Nisbet & Scheufele, 2009). This approach has been the foundation for community-based social marketing campaigns (McKenzie-Mohr, 2000) and has led to effective campaigns such as Melbourne Zoo’s Wipe for Wildlife to increase the use of recycled toilet paper (Smith & Wetler, 2011) and Oceanside, CA’s Scoop the Poop, It’s Your Doody pet waste clean-up (Schultz & Tabanico, 2014).

Identifying cobenefits for each segment can avoid two conventions that may be a key reason we have not seen an increase in proconservation behaviors (Schultz, 2011): a belief that insufficient public action stems from (a) a lack empathy or connection/time in nature by urban dwellers (Pyle, 2003); or (b) a lack of knowledge about the conservation issue, often referred to as the knowledge-deficit model (Heberlein, 2013). The linear assumption that knowing about a problem elicits care, which in turn translates into action, that is, a “think-care-act” paradigm (Kollmuss & Agyeman, 2002), has been discounted in numerous fields for decades such as food risk (Hansen, Holm, Frewer, Robinson, & Sandøe, 2003), obesity (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2008), natural hazard preparedness (Gaillard & Mercer, 2013), and disease transmission ( Larson, Bryan, Adler, & Blane, 1997), including conservation (Fischer, Seige, van der Wal, & Larson, 2014; Howell, 2014; Schultz, 2011). However, the majority of public campaigns are still based on these faulty premises (Kanagavel, Raghavan, & Veríssimo, 2014; McLeod, Hine, Bengsen, & Driver, 2017; Metcalfe, 2019). Furthermore, the application of a linear “think-care-act” model in campaigns and policies may be counterproductive, causing disengaged people to become more entrenched in their beliefs and lack of action, as has been seen with climate change (Ashworth, Jeanneret, Gardner, & Shaw, 2011).

This research sought to differentiate segments within the Auckland, New Zealand population based on a range of values and beliefs. Auckland is New Zealand’s largest city, and one third of New Zealand’s 4.7 million population live in the Auckland region (Statistics New Zealand, 2017). New Zealand has had significant biodiversity loss, especially of bird species, over the last 700 years (Robertson et al., 2016). In 2016, research showed that the overwhelming majority of New Zealanders (85%) said that conservation is personally important to them but only 12% spent time helping on a conservation project (Ipsos, 2016). Therefore, because of the large size of Auckland’s population, involving more Aucklanders in conservation is especially critical.

As well as contributing to the literature, the findings from this research can be used to develop targeted interventions that more closely align with the specific psychological profile of each segment, which may lead to greater uptake of the desired proconservation behaviors. Building on theoretical and empirical insights from the literature, a range of variables linked to environmental behavior, either directly or indirectly, were used for the segmentation analysis and to identify possible cobenefits.

2 | METHODS

An online survey was completed using two online panels—the Colmar Brunton© Panel and the SSI Panel. Panelists...
only received points for completing the survey which are redeemed for goods or services; thus, there was no missing data. Interviewing targets were calculated using the most recent (2013) census and included ages within gender within subregion, as well as ethnicity within subregion.

The survey was piloted for 4 days between 25 and November 28, 2016 and minor changes were made based on feedback. The main survey was then open for 20 days between 29 November and December 18, 2016 and took approximately 20 min to complete. Altogether, 2,124 surveys were completed.

2.1 Selection of variables for profiling segments

While broad environmental and conservation concern and knowledge may not suffice for predicting proenvironmental or proconservation behaviors, we included them to explore their relationship to New Zealand-specific proconservation behaviors. Thus, we included the following environmentally focused variables.

2.1.1 New ecological paradigm (NEP)

The NEP measures ecological worldview or general beliefs about the relationship of humans to the environment (Dunlap, van Liere, Mertig, & Jones, 2000; Hawcroft & Milfont, 2010) and is commonly used as a measure of environmental concern, environmental values or proenvironmental attitudes (Dunlap, 2008). Along with its predecessor, the New Environmental Paradigm, the NEP has become the most widely used measure of environmental concern (Dunlap, 2008; Hawcroft & Milfont, 2010; Stern, Dietz, & Guagnano, 1995). The NEP has recently been found to predict environmental concern and mediates the influences of sociodemographic variables (Xiao, Dunlap, & Hong, 2018). In this context, we used NEP as one indicator of a proenvironmental attitude and was measured with 15 items, for example, “When humans interfere with nature it often produces disastrous consequences” on a scale from 1 (strongly disagree) to 5 (strongly agree) (Dunlap et al., 2000).

2.1.2 Environmental locus of control

An individual’s environmental locus of control captures the degree to which he or she believes that his or her actions can have a positive impact on and bring about change for the environment (Hines, Hungerford, & Tomera, 1987; McMullin, Hockett, & McClafferty, 2007). People with an external environmental locus of control perceive themselves as being powerless, endowed with little influence over outcomes and as such, these individuals may be less likely to carry out proenvironmental behaviors due to perceptions that their individual actions do not make a difference. Likewise, people with an internal environmental locus of control believe their actions are part of a collective and that their behaviors can make a difference (McCarty & Shrum, 2001; Price & Leviston, 2014). Environmental locus of control was included as it captured a people’s attitudes toward their ability to foster change for the environment. It was measured with four items, for example, “I have control over my own impact on the environment” on a scale from 1 (strongly disagree) to 5 (strongly agree) (McMullin et al., 2007).

2.1.3 Environmental concern

Concern for the environment can be driven by the consequences of environmental issues for individuals (egoistic), important for others (social-altruistic), or for nature itself (biospheric) (Schultz, 2001; Stern & Dietz, 1994). Those people who tend to hold egoistic values are predisposed to protect aspects of the environment that impact them personally, or to oppose the protection of the environment if the personal costs are perceived as being high (Stern & Dietz, 1994). Social-altruistic values are often expressed as concern for environmental issues on the basis of what costs or benefits they will likely produce for other people, while biospheric environmental concerns are based on a valuing for all living things (Schultz, 2001). Each of these value orientations can provide a distinct basis for environmental concern, meaning two people could express the same level of concern about an environmental issue for fundamentally different reasons (Schultz, 2001). Environmental concern was measured with 12 items on scale of 1 (not important) to 7 (supreme importance) (Schultz, 2001).

2.1.4 Connectedness to nature

The connectedness to nature scale (CNS) measures the extent to which individuals are emotionally connected to the natural world. It has been found to predict proenvironmental behaviors in some instances (Dutcher, Finley, Luloff, & Johnson, 2007; Mayer & Frantz, 2004). Connection to nature has been linked to environmental protection behaviors (Gosling & Williams, 2010) and to some forms of outdoor recreation (Wolsko & Lindberg, 2013). CNS has also been linked to improved cognition (Bratman, Daily, Levy, & Gross, 2015) and happiness (Capaldi, Dopko, & Zelenski, 2014). CNS was used to measure another dimension of proenvironmental attitude in addition to that measured by NEP. Fourteen items were measured, for example, “I often feel a sense of oneness with the natural world around me” on a scale from 1 (strongly disagree) to 5 (strongly agree).
One likely cobenefit of proconservation behavior is improvements to the immediate environments of individuals who engage in such behavior. While one element of this may come from their actual concern for the environment, a range of other factors are also involved, including valuing the preservation of a particular lifestyle, protection from health risks (e.g., pollution), or increases in property values. At a higher level, other cobenefits may be based on personal identification with places (as is the case with national identity), in which cases people may aim to preserve the physical environment as an expression of their desire to preserve or manifest their connection to a social identity. The following connectedness to place variables was also included in the survey.

2.1.5 | Place attachment

Place attachment refers to a positive connection or bond between a person and a particular place (Gosling & Williams, 2010; Williams & Vaske, 2003), which typically applies to places where people live and spend their time. Several studies have found an association between place attachment and proenvironmental behaviors (Halpenny, 2010; Lai & Kreuter, 2012; Stedman, 2002), which suggest that as people develop an attachment to a place they are more likely to want to protect it (Hernández, Martín, Ruiz, & Hidalgo, 2010; Lai & Kreuter, 2012; Tonge, Ryan, Moore, & Beckley, 2015), and will, in turn, oppose the degradation of its environment (Vorkinn & Riese, 2001). Research on the association between place attachment and proenvironmental behaviors in urban settings is comparatively rare, with research tending to focus on rural communities (Krasny, Crestol, Tidball, & Stedman, 2014; Wakefield, Elliott, Cole, & Eyles, 2001) and parks and protected areas (Halpenny, 2010; Ramkissoon, Smith, & Weiler, 2013; Tonge et al., 2015). Moreover, some studies have suggested that place attachment is lower in cities compared with less-populated areas (Lewicka, 2011). Thus, we included this metric to explore its relationship to environmental and conservation behaviors in an urban context. Place attachment was measured with eight items, for example, “I am happiest when I’m in Auckland” on a scale from 1 (strongly disagree) to 5 (strongly agree) (Gosling & Williams, 2010).

2.1.6 | National identity

As a type of social identity, national identity measures the degree to which an individual identifies with a collective concept relating to their nation (Lilli & Diehl, 1999). Research from Italy found a link between regional identity and support for the establishment of new national parks (Carrus, Bonaiuto, & Bonnes, 2005). Additionally, Rinne and Fairweather’s (2011) research presents evidence which suggests that, for a proportion of the population, the physical environment is a key part of the New Zealand national identity. Based on these studies, it is reasonable to speculate that concepts of identity at a wider regional or national scale could influence proenvironmental behaviors, either directly or indirectly, via more positive environmental attitudes. National identity was measured with 10 questions, for example, “overall I feel that being a member of New Zealand is worthwhile” on a scale from 1 (strongly agree) to 8 (strongly disagree) (Lilli & Diehl, 1999).

Another cobenefit for engaging in environmental and conservation behaviors may be an enhancement to the individual’s lifestyle, health, or recreational activities as a result of the action. Spending time in nature or engaging in outdoor activities may have little to do with nature and be more about the utilitarian use of nature.

2.1.7 | Outdoor activities/behaviors

Participation in outdoor recreation activities has been found to be associated with greater environmental concern and/or protection, particularly when recreation activity is frequent or when an emotional connection with nature develops (Harbrow, 2018). Overall, the relationship between participation in outdoor activities and proenvironmental attitudes and behaviors may vary depending on the environmental issue, the behavior, or the type of recreation that is undertaken (Dunlap & Heffernan, 1975; Nisbet, Cooper, & Garrett, 2015; Teisl & O’Brien, 2003; Thapa & Graefe, 2003). Thus, we explore what commonalities can be found between the codrivers and benefits of engaging in recreation/outdoor activities and proconservation behaviors, such that the promotion of one may enable the uptake of the other. Nine items, for example, “mountain biking,” were measured by indicating frequency over the last 3 months by 1 (never) to 5 (most days) (Department of Conservation, 2016).

2.1.8 | Well-being

The well-being measures included are commonly used to capture a range of mental and physical well-being outcomes (Diener, Emmons, Larsen, & Griffin, 1985; Whitburn, 2014). These measures were included based on research which has shown a relationship between experience and connection with the natural environment and human health and well-being (Pretty et al., 2005). Additionally, Bowler et al. (2010) found increases in exercise and intrinsic and restorative qualities when spending time in nature. Thus, we wanted to explore how proenvironmental behavior relates to well-being; again, for the identification for potential cobenefits (and thus comotivators). Overall well-being was measured with five items, for example, “I have felt calm and relaxed,” with
respondents indicating agreement over the last 2 weeks from 1 (strongly disagree) to 5 (strongly agree) (Topp, Østergaard, Søndergaard, & Bech, 2015). Satisfaction with life was measured with five items, for example, “I am satisfied with my life” measured on a scale from 1 (strongly disagree) to 5 (strongly agree) (Diener et al., 1985). Physical health was measured with a single item, “how has your general health been over the last three months?” on a scale from 1 (very poor) to 5 (excellent) (Whitburn, 2014).

As noted, we explored proenvironmental behaviors and a special subset of proconservation behaviors unique to New Zealand.

### 2.1.9 Environmental behaviors

Proenvironmental behaviors are actions by individuals or groups that promote or result in the sustainable use of natural resources (Sivek & Hungerford, 1989). Respondents rated a list of six items, for example, “take reusable bags when shopping” by indicating frequency of 1 (never) to 5 (always) (Department of Conservation, 2016).

### 2.1.10 Conservation behaviors

A further subset of interest were behaviors that support the conservation of biodiversity (Schultz, 2011). These include actions carried out in one’s home or community (e.g., removing pest species, planting native rather than introduced plants, keeping cats inside at night, and river and beach clean ups). Due to New Zealand’s specific environmental and social context, conservation is considered one of the most prominent environmental issues, thus these behaviors are particularly pertinent for the context of this study. Respondents rated a list of eight behaviors, for example, “help with weeding in parks or reserves” by indicating frequency of 1 (never) to 5 (always). Behaviors were filtered for those who had a garden, owned a cat or dog (Department of Conservation, 2016).

### 2.1.11 Perceived barriers and benefits

Some studies have identified potential barriers that inhibit individuals from acting on their proenvironmental attitudes. Diekmann and Preisendörfer (2003) proposed and tested a “low-cost hypothesis” where they predicted that environmental concern would influence ecological behavior primarily when individual costs and inconveniences were low. The theory postulates that proenvironmental attitudes would have less predictive power on behaviors when these barriers or the costs of performing that behavior were high. Costs may be finances, time, discomfort or other subjectively defined inhibitions of behaviors. This measure was used to identify the potential cobarriers from which cobenefits could be indirectly inferred (e.g., a proenvironmental behavior that saves people money). Respondents checked up to six items that apply, for example, “I don’t have the time” (Department of Conservation, 2016).

In addition to current levels of conservation behaviors, we measured engagement with future conservation behaviors via choice modeling (Louviere, Hensher, & Swait, 2000) (see Supporting Information). The following demographics were collected: age, gender, cultural identity, country of birth, suburb of Auckland, education level, household makeup, number and age of children in household, and household income.

### 2.2 Data analysis

Prior to creating the population segments, we validated the constructs and tested for parametric assumptions (see Supporting Information). Next, the segments were characterized using a two-step clustering approach (Rundle-Thiele, Kubacki, Tkaczynski, & Parkinson, 2015). A two-step cluster analysis was used as that data was both continuous and categorical (Chiu, Fang, Chen, Wang, & Jeris, 2001). Using the Bayesian information criterion (BIC), the best number of clusters was identified. Once the best number of clusters was identified, we validated the clusters two ways. First, the silhouette measure of cohesion and separation, a measure of how close each point in a cluster is to the points in its neighboring clusters (from –1 to +1), was calculated. The higher the value >0, the more robust the cluster configuration (Thinsungnoenapa, Kaoungkub, Durongdumronchoaib, Kerdprasopb, & Kerdprasopb, 2015). Next, a test of significance was performed on each construct to identify the differences (if any) amongst the clusters.

### 3 RESULTS

The demographic makeup of our sample was 56% female and 44% male compared to the 2013 Auckland census population of 51% female and 49% male. Twenty-three percent of respondents were 18–30 years of age (compared to 28% of the Auckland population), 27% of respondents were 31–44 years of age (compared to 27% of the Auckland population), 34% of respondents were 45–64 years of age (compared to 31% of the Auckland population), 15% of respondents were over 65 years of age (compared to 15% of the Auckland population). Ethnic makeup of respondents was 81% New Zealand European (compared to 59% of the Auckland population), 24% Māori (compared to 11% of the Auckland population), 27% Pacific Islander (compared to 15% of the Auckland population), and 29% Asian (compared to 23% of the Auckland population). In our study, females were slightly overrepresented and all ethnic groups were
over represented suggesting respondents identified with multiple ethnicities compared to the census data.

Two-step cluster analysis (Horn & Huang, 2009) yielded four segments with an adequate silhouette measure of cohesion and separation of 0.3. Three of the authors (E.M., M.H., and A.W.) reviewed the clusters that emerged from the two-step analysis and concurred they made theoretical and pragmatic sense, as suggested by Prayag (2012).

3.1 Four segment model

The first segment (n = 671; 32%) we refer to as Environmentally Active and had a high rate of proenvironmental and proconservation behaviors (Table 1) and strong altruistic concern (Table 2) coupled with moderate levels of NEP and CNS (Figure 1). They had the lowest rate of outdoor activities across the four segments (Figure 1). This segment also had higher physical health (M = 2.43 ± 0.04), environmental locus of control (M = 3.64 ± 0.02), and national identity (M = 6.44 ± 0.05) than the average but lower well-being (M = 3.25 ± 0.04), place attachment (M = 3.22 ± 0.03) and satisfaction with life (M = 3.29 ± 0.03). This segment listed all barriers to engagement at higher than average rates (Figure 2).

The second segment (n = 592; 28%) we named the Well Informed and had the highest egoistic concern (Table 2) and high CNS, NEP, and outdoor activities but lower than average proenvironmental behaviors (Figure 1). This segment was high in national identity (M = 6.77 ± 0.05), well-being (M = 3.63 ± 0.04), satisfaction with life (M = 3.60 ± 0.04), environmental locus of control (M = 3.91 ± 0.02) and place attachment (M = 3.30 ± 0.04) and was slightly lower in physical well-being (M = 2.20 ± 0.04). Compared with the other three segments, this segment reported all barriers at a significantly lower rate (Figure 2).

The third segment (n = 410; 19%) are referred to as the Active Outdoors and had the highest rate of outdoor activities (Figure 1), with further analysis showing a skew toward active and equipment-based pursuits such as fishing, mountain biking and diving. They had a higher degree of biospheric concern (Table 2) with an average CNS but lower than average NEP and environmental behaviors (Figure 1). For this segment only, there was a negative correlation between outdoor activity and environmental behaviors, r (410) = −0.032, p > .05. The third segment was high in wellbeing (M = 3.67 ± 0.03) and satisfaction with life (M = 3.59 ± 0.03) but lower than average in national identity (M = 6.02 ± 0.05), physical health (M = 2.07 ± 0.04), and environmental locus of control (M = 3.54 ± 0.03). Place attachment was similar to the average (M = 3.31 ± 0.03). Lack of transport and too expensive were key defining barriers for this segment (Figure 2).

The fourth and final segment (n = 451; 21%) we named the Socially Motivated and had the highest rate of proenvironmental behaviors but was low in CNS and had the lowest rate of outdoor behavior, NEP (Figure 1) and environmental concern (Table 2). This segment had high

| Segment                  | Environmentally active | Well informed | Active outdoors | Socially motivated |
|--------------------------|------------------------|---------------|-----------------|-------------------|
| Help clean up beaches (%)| 91                     | 72            | 41              | 91                |
| Help clean up rivers (%) | 97                     | 84            | 54              | 96                |
| Help with tree planting in local community (%) | 96                     | 82            | 47              | 94                |
| Trap rats on property (%) | 75                     | 61            | 32              | 74                |
| Help with weeding in local parks and reserves (%) | 97                     | 84            | 54              | 95                |
| Choose native plants rather than non-native for garden (%) | 52                     | 20            | 20              | 59                |
| Donate money to groups who work to improve or protect the natural environment (%) | 68                     | 40            | 32              | 76                |

Table 1 Percentage of respondents across the four Auckland population segments currently engaging regularly in conservation behaviors (n = 2,124)

Table 2 Environmental concern across the four Auckland population segments (mean and SE) (n = 2,124)
physical health ($M = 2.40 \pm 0.04$) but was low in national identity ($M = 6.08 \pm 0.06$), wellbeing ($M = 3.22 \pm 0.04$), place attachment ($M = 3.12 \pm 0.04$), satisfaction with life ($M = 3.26 \pm 0.04$) and environmental locus of control ($M = 3.26 \pm 0.02$). One in five members of this segment cited lack of interest as the reason for lack of environmental action (Figure 2).

### 4 | DISCUSSION

The focus of our research was to assess our target population (Aucklanders) for drivers of conservation behaviors, acknowledging that people can engage in the same behavior for a variety of reasons. We also aimed to explore and identify potential co-benefits (other than conservation) as they relate to pro-conservation behaviors in an urban population, as these may provide insights for developing communicative frames aimed at increasing proconservation behavior. As Hine et al. (2014) state, “although many studies explicitly note the relevance of segmentation in developing tailored and targeted message content, relatively few have made specific recommendations about message content.” This discussion aims to provide such recommendations. The urban context of New Zealand (Auckland City) presented a useful context to conduct such research due to the combination of the nation’s significant conservation needs and the city’s growing urban population and existing low levels of pro-environmental behavior.

The environmentally active segment was characterized by a strong commitment to conservation and the environment via high frequency of proconservation behaviors and concern for the environment. A wide variety of messages could motivate members of the environmental active segment including those focused on the consequences of environmental problems for nature, themselves, other people, and future generations. Messages drawing on links between our national identity and the degrading biodiversity may also resonate with them. Due to the existing high rates of pro-conservation behavior, future advocacy campaigns could target this segment for a new or emerging conservation behaviors, as they could be the early adopters. Traditional knowledge campaigns based on the linear premise of think-care-act (e.g., providing a pamphlet about the impact of invasive species with the top-ten weeds to remove from your garden) may be successful for the environmentally active. However, using co-benefits to sustain motivation or improve the experience of conservation may also be effective. Given that this segment was associated with lower health and wellbeing, and moderate connectedness to nature, initiatives that...
integrate cobenefits that encourage more outdoor activity (such as tree planting or beach clean ups) for personal health or social connection may be effective.

The well-informed segment was characterized by a somewhat paradoxical combination of high concern and knowledge of environmental and conservation issues and perception that as individuals, they can make a difference, yet low levels of actual behavioral performance, which is indicative of the attitude-behavior gap (Newton & Meyer, 2013). This contradiction, alongside the well-informed high levels of national and regional identification, reflects people liking the idea of a conservation lifestyle and being well informed, but do not act on these beliefs. The challenge with this segment is to find a way to turn people's stated sense of care into active behavior. Effort targeting the well informed could yield the greatest reward, as it is the second largest segment. Messages that draw on nationally and locally iconic themes or places may help to motivate them alongside those focused on the impacts of environmental problems on nature, other people and future generations. Focusing on the cobenefits of conservation activities and improvements to their own property or neighborhood may be an effective approach (e.g., encouraging replanting or restoration in their neighborhood or along the paths they walk their dog). Given the well informed already exhibits conservation awareness and concern, providing specific and practical advice or feedback on their lack of action (Hine et al., 2015) or by leveraging social norms via their national or regional identity (Schultz, 2007) may increase conservation behavior. Making activities convenient and easy to do (e.g., providing prompts or obtaining commitment to follow through) may also increase the likelihood of people in this segment taking action (Schultz, 2014).

Members of the active outdoors were primarily characterized by their high use of nature, rather than their views on nature. With the greatest frequency of outdoor activity, alongside low environmental and conservation interest, concern and knowledge, advocating cobenefits between conservation behaviors and their outdoor lifestyles or preservation of their favored recreation sites, may appeal to people in this segment (e.g., rat trapping can reduce degradation of mountain bike tracks and decrease the chance of a biking accident). Lack of time or skills can be a barrier for this group participating in conservation behaviors, and they are also more likely than other segments to cite lack of money and transport as a barrier. Activities that are their linked to their recreation sites and are facilitated by others (e.g., once a month rat trapping organized by the local mountain bike club) may be more appealing to the active outdoors. Furthermore, members of the active outdoors segment are less likely to feel that they can make a difference to the environment through their own actions. Messaging should support and reinforce behaviors and provide feedback on the impact of contributions from people like themselves (e.g., feedback via their biking club’s social media on number of rats caught per week in traps set up by the mountain bike club).

Finally, members of the socially motivated segment were characterized, somewhat paradoxically, by high engagement in conservation behaviors but low scores on all the other environmental variables that are often assumed to be the causes of such behaviors (e.g., concern about environmental issues). One likely interpretation is the behaviors being performed are motivated by reasons other than conservation and environmental attitudes (i.e., cobenefits). Thus, traditional messaging that highlights the need for action due to care or concern for the environment may have little impact on the socially motivated. Ironically, this segment is the kind traditionally viewed as problematic under the “think-care-act” model as they exhibit minimal “think” or “care,” yet they still exhibit a high level of “act.” Members of socially motivated generally prefer to donate money to conservation programs rather than undertake action themselves. They also show a preference for undertaking conservation on their own properties rather than in their community or region.

Encouraging action (e.g., donating money to local conservation organizations or actions on their own property) in the socially motivated segment may be through others in their household (e.g., children) or through organizations they are involved with (e.g., churches or schools) given the segment highly values social connection. Messages that highlight social motivations to protect the environment (i.e., impacts on children, other people, and future generations) or emphasizing the social nature of the activity (e.g., tree planting with friends) will most likely be more effective than extolling the conservation virtues of the activity.

Overall, our results indicate that a traditional one-size-fits-all “think-care-act” approach to engaging urban residents in greater conservation behavior will be ineffective, as it will only “preach to the choir” (Scheufele, 2018) or the environmentally active and alienate the remaining 70% of the Auckland population. We need to move beyond broad, population-based approaches, given the nuances that can be detected through careful psychographic segmentation of the public. Thus, we suggest tailored messages for each population segment that align to the cobenefits of engaging in proenvironmental and conservation behaviors specific to them. Developing campaigns that integrate cobenefits such as beautification of their neighborhood (well informed), enhancing recreation sites (active outdoors), or spending time with family or friends (socially motivated) may be more effective. With this knowledge, effective strategies can be designed and implemented to target each segment for maximum impact (Maibach, Roser-Renouf, & Leiserowitz, 2009). While this approach has been increasingly used for climate change mitigation (Hine et al., 2013), it is still underutilized in conservation and biodiversity activities.

Importantly, tailored communication comes at a cost (Hine et al., 2014) and incorporating behavioral alongside attitudinal data allows for optimizing communication...
strategies. In the Auckland population, the environmentally active and socially motivated both reported high rates of proconservation behavior (despite socially motivated reporting low proconservation attitudinal measures). Targeting these segments may therefore not be the most beneficial use of limited resources. Members of the socially motivated segment reported high levels of environmental and conservation concern, but low levels of behavioral participation, suggesting a more amenable audience. It is also the second largest segment, making it the best to target expenditure of future resources. Last, active outdoors reported low attitudinal measures as well as low behavioral measures and is the typical “disengaged” segment, traditionally viewed as problematic (Burns & Medvecky, 2018). While such segments are often viewed as problematic and requiring the most attention (Ashworth et al., 2011), it is also the smallest segment (<20%) of the Auckland population, and likely the most resistant to change.

It is also important to avoid the temptation to try and shift people from one segment to another. People’s underlying values and worldviews, such as those reflected in the NEP, connectedness to nature and motivation scales, are difficult to change in adults (Manfredo et al., 2017). It is likely easier to change or design programs to meet the needs of specific segments based on cobenefits than it is to try and change people’s values to make them more receptive to conservation programs. However, we are not suggesting that we abandon all efforts to increase proconservation values and beliefs, as this can be addressed through a long-term approach (Saunders, Brook, & Eugene Myers, 2006). Put simply, multiple avenues exist for achieving biodiversity outcomes and focusing on arrange of values and beliefs, not necessarily environmental or conservation, may be the most efficient strategy.

AUTHOR’S CONTRIBUTIONS
E.M. and M.H. conceived of the study, developed the theory, and wrote the paper. E.M. and A.W. analyzed the data. E.M. managed data collection. S.J., J.K., P.T., M.P. conceived of the study and participated in the design, coordination, and interpretation of results. F.M. and J.B. assisted with interpretation of results and contributed to the final version of the manuscript.

CONFLICT OF INTEREST
All authors declare no conflict of interest.

DATA ACCESSIBILITY
Anonymized data is deposited at the following site https://osf.io/s8r73/.

ETHICS STATEMENT
Data collection adhered to ISO 20252:2012 certification and the project adhered to Research Association of New Zealand’s Code of Practice; all responses were confidential.

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REFERENCES
Ashworth, P. Jeanneret, Talia, Gardner, John, Shaw, Hylton (2011) Communication and climate change: What the Australian public thinks. Technical Report, p. 68. https://doi.org/10.1088/1742-6596/304/1/012073.
Bain, P. G., Milfont, T. L., Kashima, Y., Bilewicz, M., Doron, G., Garbarsdottir, R. B., … Saviolidis, N. M. (2016). Co-benefits of addressing climate change can motivate action around the world. Nature Climate Change, 6(2), 154–157. https://doi.org/10.1038/nclimate2814
Baranowski, T., Cullen, K. W., Nicklas, T., Thompson, D., & Baranowski, J. (2008). Are current health behavioral change models helpful in guiding prevention of weight gain efforts? Obesity Research, 16(S10), 23S–43S. https://doi.org/10.1038/oby.2003.222
Bennett, N. J., Roth, R., Klain, S. C., Chan, K. M. A., Clark, D. A., Cullman, G., … Verissimo, D. (2017). Mainstreaming the social sciences in conservation. Conservation Biology, 31(1), 56–66. https://doi.org/10.1111/cobi.12788
Bowler, D. E., Buyung-ali, L. M., Knight, T. M., & Pullin, A. S. (2010). A systematic review of evidence for the added benefits to health of exposure to natural environments. Retrieved from http://bmcpublichealth.biomedcentral.com/articles/10.1186/1472-2458-10-456
Bratman, G. N., Daily, G. C., Levy, B. J., & Gross, J. J. (2015). The benefits of nature experience: Improved affect and cognition. Landscape and Urban Planning, 138, 41–50. https://doi.org/10.1016/j.landurbplan.2015.02.005
Burns, M., & Medvecky, F. (2018). The disengaged in science communication: How not to count audiences and publics. Public Understanding of Science, 27(2), 118–130. https://doi.org/10.1177/0963662516678351
Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014). The relationship between nature connectedness and happiness: A meta-analysis. Frontiers in Psychology, 5, 876. https://doi.org/10.3389/fpsyg.2014.00976
Carrus, G., Bonaiuto, M., & Bonnes, M. (2005). Environmental concern, regional identity, and support for protected areas in Italy. Environment and Behavior, 37(2), 237–257. https://doi.org/10.1177/0014482505278682
Chiu, T., Fang, D.-P., Chen, J., Wang, Y., & Jeris, C. (2001). A robust and scalable clustering algorithm for mixed type attributes in large database environment. In Proceedings of the 7th ACM SIGKDD international conference on knowledge discovery and data mining. ACM SIGKDD (pp. 263–268). San Francisco, CA.
Cormick, C., & Romanach, L. M. (2014). Segmentation studies provide insights to better understanding attitudes towards science and...
technology. *Trends in Biotechnology*, 32(3), 114–116. https://doi.org/10.1016/j.tibtech.2013.12.005

Department of Conservation. (2016). *Survey of New Zealanders*. Wellington, New Zealand. Retrieved from http://www.doc.govt.nz/about-us/our-role/managing-conservation/recreation-management/visitor-statistics-and-research/survey-of-new-zealanders/.

Diekmann, A., & Preisendörfer, P. (2003). Green and greenback: The behavioral effects of environmental attitudes in low-cost and high-cost situations. *Rationality and Society*, 15(4), 441–472. https://doi.org/10.1177/1043463103154002

Dunlap, R. E., & Heffernan, R. B. (1975). Outdoor recreation and environmental attitudes to food risks. *Appetite*, 1(1), 17–26. https://doi.org/10.1016/0195-6663(75)90123-7

Dunlap, R. E., van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). New trends in measuring environmental attitudes: Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues*, 56(3), 425–442. https://doi.org/10.1111/0022-4531.00176

Dutch, D. L., Finley, J. C., Luloff, A. E., & Johnson, J. B. (2007). Connectivity with nature as a measure of environmental values. *Environment and Behavior*, 39(4), 474–493. https://doi.org/10.1177/00139165060298794

Fischer, A., Selge, S., van der Wal, R., & Larson, B. M. H. (2014). The public and professionals reason similarly about the management of non-native invasive species: A quantitative investigation of the relationship between beliefs and attitudes. *PLoS One*, 9(8), 1–10. https://doi.org/10.1371/journal.pone.0105495

Gaillard, J. C., & Mercer, J. (2013). From knowledge to action: Bridging gaps in disaster risk reduction. *Progress in Human Geography*, 37(1), 93–114. https://doi.org/10.1177/0309132512466717

Gosling, E., & Williams, K. J. H. (2010). Connectedness to nature, place attachment and conservation behaviour: Testing connectedness theory among farmers. *Journal of Environmental Psychology*, 30(3), 298–304. https://doi.org/10.1016/j.jenvp.2010.01.005

Halpenny, E. A. (2010). Pro-environmental behaviours and park visitors: The effect of place attachment. *Journal of Environmental Psychology*, 30(4), 409–421. https://doi.org/10.1016/j.jenvp.2010.04.006

Hansen, J., Holm, L., Frewer, L., Robinson, P., & Sandoe, P. (2003). Beyond the knowledge deficit: Recent research into lay and expert attitudes to food risks. *Appetite*, 41(2), 111–121. https://doi.org/10.1016/S0195-6663(03)00079-5

Harbrow, M. A. (2018). Visitors as advocates: a review of the relationship between participation in outdoor recreation and support for conservation and the environment. Wellington, New Zealand: Department of Conservation. Retrieved from https://www.doc.govt.nz/globalassets/documents/science-and-technical/sfc333entire.pdf

Hawcroft, L. J., & Milfont, T. L. (2010). The use (and abuse) of the new environmental paradigm scale over the last 30 years: A meta-analysis. *Journal of Environmental Psychology*, 30(2), 143–158. https://doi.org/10.1016/j.jenvp.2009.10.003

Heberlein, T. A. (2013). Navigating environmental attitudes. *Navigating Environmental Attitudes*, 26(4), 1–240. https://doi.org/10.1093/acprof:oso/9780199773329.001.0001

Hernández, B., Martín, A. M., Ruiz, C., & Hidalgo, M. C. (2010). The role of place identity and place attachment in breaking environmental protection laws. *Journal of Environmental Psychology*, 30, 281–288. https://doi.org/10.1016/j.jenvp.2010.01.009

Hine, D. W., Reser, J. P., Morrison, M., Phillips, W. J., Nunn, P., & Cooksey, R. (2014). Audience segmentation and climate change communication: Conceptual and methodological considerations. *Wiley Interdisciplinary Reviews: Climate Change*, 5(4), 441–459. https://doi.org/10.1002/wcc.279

Hine, D. W., Reser, J. P., Phillips, W. J., Cooksey, R., Marks, A. D. G., Nunn, P., … Glendon, A. I. (2013). Identifying climate change interpretive communities in a large Australian sample. *Journal of Environmental Psychology*, 36, 229–239. https://doi.org/10.1016/j.jenvp.2013.08.006

Hine, D. W., Please, P., McLeod, L., & Driver, A. (2015). Behaviourally effective communications for invasive animals management: A practical guide. Canberra, Australia: Invasive Animals Cooperative Research Centre.

Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and synthesis of research on responsible environmental behaviour: A meta-analysis. *Journal of Environmental Education*, 18(2), 1–8. https://doi.org/10.1080/00958964.1987.9943482

Horn, B., & Huang, W. (2009). Comparison of segmentation approaches. *Decision Analyst*, 1–12. Available at: www.decisionanalyst.com

Howell, R. A. (2014). Investigating the long-term impacts of climate change communications on individuals’ attitudes and behavior. *Environment and Behavior*, 46(1), 70–101. https://doi.org/10.1177/0013916512452428

Ipsos. (2016). *Survey of New Zealanders*. Wellington, New Zealand: Department of Conservation. Retrieved from www.doc.govt.nz/Documents/about-doc/role/visitor-research/survey-of-new-landers-2016.pdf

Kahn, M. E., & Matsusaka, J. G. (1997). Demand for environmental goods: Evidence from voting patterns on California initiatives. *The Journal of Law and Economics*, 40(1), 137–173. https://doi.org/10.1086/467369

Kanagavel, A., Raghavan, R., & Verissimo, D. (2014). Beyond the “general public”?: Implications of audience characteristics for promoting species conservation in the Western Ghats Hotspot, India. *Ambio*, 43(2), 138–148. https://doi.org/10.1007/s13280-013-0434-2

Khare, A. (2015). Antecedents to green buying behaviour: A study on consumers in an emerging economy. *Marketing Intelligence & Planning*, 33(3), 309–329. https://doi.org/10.1108/MIP-05-2014-0083

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3), 239–260. https://doi.org/10.1080/13504620220145401

Krasny, M. E., Crestolu, S. R., Tidball, K. G., & Stedman, R. C. (2014). New York City’s oyster gardeners: Memories and meanings as motivations for volunteer environmental stewardship. *Landscape and Urban Planning*, 132, 16–25. https://doi.org/10.1016/j.landurbplan.2014.08.003

Lai, P., & Kreuter, U. P. (2012). Examining the direct and indirect effects of environmental change and place attachment on land management decisions in the Hill Country of Texas, USA. *Landscape and Urban Planning*, 104, 320–328. https://doi.org/10.1016/j.landurbplan.2011.11.007
Larson, E. L., Bryan, J. L., Adler, L. M., & Blane, C. (1997). A multi-faceted approach to changing handwashing behavior. *American Journal of Infection Control, 25*(1), 3–10. https://doi.org/10.1016/S0196-6535(97)90046-8

Leiserowitz, A., Maibach, E., Roser-Renouf, C., & Smith, N. (2011). *Global warming’s six Americas.* Retrieved from http://www.earthtoshky.org/content/course-content/2012-mini-course/ Knowledgde_of_Audience/SixAmericasMay2011.pdf

Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology, 31,* 207–230. https://doi.org/10.1016/j.jenvp.2010.10.001

Lilli, W., & Diehl, M. (1999). *Measuring national identity.* Mannheim. Germany. Retrieved from http://edoc.vifapol.de/opus/volltexte/2014/5105/pdf/wp_10.pdf

Louviere, J. J., Hensher, D. A., & Swait, J. D. (2000). Stated choice methods: Applications and analysis. Cambridge, England: Cambridge University Press.

Maibach, E., Roser-Renouf, C., & Leiserowitz, A. (2009) *Global warming’s six Americas 2009: An audience segmentation analysis.* Retrieved from https://cdn.americanprogress.org/wp-content/uploads/issues/2009/05/pdf/6americas.pdf

Maibach, E. W. (1993). Social marketing for the environment: Using information campaigns to promote environmental awareness and behavior change. *Health Promotion International, 8*(3), 209–224. https://doi.org/10.1093/heapro/8.3.209

Manfredo, M. J., Bruskotter, J. T., Teel, T. L., Fulton, D., Schwartz, S. H., Arlinghaus, R., … Sullivan, L. (2017). Why social values cannot be changed for the sake of conservation. *Conservation Biology, 31*(4), 772–780. https://doi.org/10.1111/cobi.12855

Mayer, F. S., & Frantz, C. M. P. (2004). The connectedness to nature scale: A measure of individuals’ feeling in community with nature. *Journal of Environmental Psychology, 24*(4), 503–515. https://doi.org/10.1016/j.jenvp.2004.10.001

McCarty, J. A., & Shrump, L. J. (2001). The influence of individualism, collectivism, and locus of control on environmental beliefs and behaviour. *Journal of Public Policy & Marketing, 20*(1), 93–104. https://doi.org/10.1509/jppm.20.1.93.17291

McKenzie-Mohr, D. (2000). Fostering sustainable behavior through community-based social marketing. *American Psychologist, 55*(5), 531–537. https://doi.org/10.1037//0003-066X.55.5.531

McLeod, L. J., Hine, D. W., Bengsen, A. J., & Driver, A. B. (2017). Assessing the impact of different persuasive messages on the intentions and behaviour of cat owners: A randomised control trial. *Preventive Veterinary Medicine, 146*(April), 136–142. https://doi.org/10.1016/j.prevetmed.2017.08.005

McLeod, L. J., Hine, D. W., Please, P. M., & Driver, A. B. (2015). Applying behavioral theories to invasive animal management: Towards an integrated framework. *Journal of Environmental Management, 161,* 63–71. https://doi.org/10.1016/j.jenvman.2015.06.048

McMullin, S. L., Hockett, K. S., & McClafferty, J. A. (2007). Does angling or boating improve the stewardship ethic of participants? In B. A. Knuth & W. F. Siemer (Eds.), *American fisheries society symposium 55* (pp. 145–155). San Francisco, CA: American Fisheries Society.

Metcalfe, J. (2019) ‘Comparing science communication theory with practice : An assessment and critique using Australian data’, 28(4), 382–400. https://doi.org/10.1177/0963662518821022.

Newton, P., & Meyer, D. (2013). Exploring the attitudes-action gap in household resource consumption: Does “Environmental Lifestyle” segmentation align with consumer behaviour? *Sustainability, 5*(3), 1211–1233. https://doi.org/10.3390/su5031211

Nisbet, E. C., Cooper, K. E., & Garrett, R. K. (2015). The partisan brain: How dissonant science messages lead conservatives and libera to (dis)trust science. *Annals of the American Academy of Political and Social Science, 658*(1), 36–66. https://doi.org/10.1177/0002716214555474

Nisbet, M. C., & Scheufele, D. A. (2009). What’s next for science communication? Promising directions and lingering distractions. *American Journal of Botany, 96*(10), 1767–1778. https://doi.org/10.3732/ajb.0900041

Oliver, J. D., & Rosen, D. E. (2010). Applying the environmental propensity framework: A segmented approach to hybrid electric vehicle marketing strategies. *Journal of Marketing Theory and Practice, 18*(4), 377–393. https://doi.org/10.2753/mtp1069-6679180405

Prayag, G. (2012). Paradise for who? Segmenting visitors’ satisfaction with cognitive image and predicting behavioural loyalty. *International Journal of Tourism Research, 14*(1), 1–15. https://doi.org/10.1002/itjr.837

Pretty, J., Peacock, J., Hine, R., Sellens, M., South, N., & Griffin, M. (2007). Green exercise in the UK countryside: Effects on health and psychological well-being, and implications for policy and planning. *Journal of Environmental Planning and Management, 50*(2), 211–231. https://doi.org/10.1080/09640560601156466

Price, J. C., & Leviston, Z. (2014). Predicting pro-environmental agricultural practices: The social, psychological and contextual influences on land management. *Journal of Rural Studies, 34,* 65–78. https://doi.org/10.1016/j.jrurstud.2013.10.001

Pyle, R. M. (2003). Nature matrix: Reconnecting people and nature. *Orx, 37*(2), 206–214. https://doi.org/10.1017/S003060530003083

Ramkissoon, H., Smith, L. D. G., & Weiler, B. (2013). Relationships between place attachment, place satisfaction and pro-environmental behaviour in an Australian national park. *Journal of Sustainable Tourism, 21*(3), 434–457. https://doi.org/10.1080/09669582.2012.708042

Rinne, T., & Fairweather, J. (2011). Modelling cultural, national and innovation identities in order to understand New Zealand’s modest innovation performance. *Sites: A Journal of Social Anthropology and Cultural Studies, 8*(2), 77–105. https://doi.org/10.11157/sites-vol8iss2id148

Robertson, H. A., Baird, K., Dowding, J. E., Elliot, G. P., Hitchmough, R. A., Miskelly, C. M., & Taylor, G. A. (2016). *Modelling cultural, national and innovation identities in order to understand New Zealand’s modest innovation performance.* Wellington, New Zealand. Retrieved from http://www.doc.govt.nz/Documents/science-and-technical/ nzts19entire.pdf.

Rundle-Thiele, S., Kubacki, K., Tkaczyński, A., & Parkinson, J. (2015). Using two-step cluster analysis to identify homogeneous innovation identities in order to understand New Zealand’s modest innovation performance. *Oryx, 37*(2), 206–214. https://doi.org/10.1017/S003060530003083

Schneider, P. A. (2018). Beyond the choir? The need to understand multiple publics for science. *Environmental Communication, 12*(8), 1123–1126. https://doi.org/10.1080/17524032.2018.1521543
Schultz, P. W. (2007). Power of social norms. Psychological Sciences, 18(5), 429–434. Retrieved from https://www.journals.org/meetings/2008/july/social-norms Cialdini.pdf.

Schultz, P. (2001). The structure of environmental concern: Concern for self, other people, and the biosphere. Journal of Environmental Psychology, 21(4), 327–339. https://doi.org/10.1006/jevp.2001.0227

Schultz, P. W. (2011). Conservation means behavior. Conservation Biology, 25(6), 1080–1083. https://doi.org/10.1111/j.1523-1739.2011.01766.x

Schultz, P. W. (2014). Strategies for promoting proenvironmental behavior: Lots of tools but few instructions. European Psychologist, 19(2), 107–117. https://doi.org/10.1027/1016-9040/a000163

Schultz, P. W., & Tabanico, J. J. (2014, 25 September). How to use community-based social marketing to foster behaviors central to a sustainable, healthy environment [webinar]. American Academy of Arts & Sciences. Retrieved from https://www4.eere.energy.gov/seeaction/events?page=1.

Seto, K. C., Güneralp, B., & Hutrya, L. R. (2012). Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. Proceedings of the National Academy of Sciences, 109(40), 16083–16088. https://doi.org/10.1073/pnas.1211658109

Sivek, D. J., & Hungerford, H. R. (1989). Predictors of responsible behaviour in members of three Wisconsin conservation organisations. Journal of Environmental Education, 21(2), 35–40. https://doi.org/10.1080/0013916990941929

Slater, M. D. (1996). Theory and method in health audience segmentation. Journal of Health Communication, 1(3), 267–283. https://doi.org/10.1080/108107396128059

Smith, L. and Weiler, B. (2011) Evaluating the effectiveness of wipe campaigns. Wellington, New Zealand. (Thesis). Wellington, New Zealand: Victoria University of Wellington.

Stedman, R. C. (2002). Toward a social psychology of place: Predicting behavior from place-based cognitions, attitude, and identity. Environment and Behavior, 34(5), 561–581. https://doi.org/10.1177/001391602034005001

Tonge, J., Ryan, M. M., Moore, S. A., & Beckley, L. E. (2015). The effect of place attachment on pro-environment behavioural intentions of visitors to coastal natural area tourist destinations. Journal of Travel Research, 54(6), 730–743. https://doi.org/10.1177/0047287514533010

Topp, C. W., Ostergaard, S. D., Søndergaard, S., & Bech, P. (2015). The WHO-5 well-being index: A systematic review of the literature. Psychotherapy and Psychosomatics, 84(3), 167–176. https://doi.org/10.1159/000376585

Vestergren, S., Drury, J., & Chiriac, E. H. (2018). How collective action produces psychological change and how that change endures over time: A case study of an environmental campaign. British Journal of Social Psychology, 57, 855–877. https://doi.org/10.1111/bjso.12270

Wakefield, S. E. L., Elliott, S. J., Cole, D. C., & Eyles, J. D. (2001). Environmental risk and (re)action: Air quality, health and civic involvement in an urban industrial neighbourhood. Health & Place, 7, 163–177. https://doi.org/10.1016/S1353-8292(01)00006-5

Walsh, G., Hassan, L. M., Shiu, E., Andrews, J. C., & Hastings, G. (2010). Segmentation in social marketing. European Journal of Marketing, 44, 1140–1164. https://doi.org/10.1108/03090561011047562

Whitburn, J. (2014). Urban vegetation, wellbeing and pro-environmental behaviour: A socio-ecological experiment in Wellington City, New Zealand. (Thesis). Wellington, New Zealand: Victoria University of Wellington.

Williams, D. R., & Vaske, J. J. (2003). The measurement of place attachment: Validity and generalizability of a psychometric approach. Forest Science, 49(6), 830–840. https://doi.org/10.1093/forests/49.6.830

Wolsko, C., & Lindberg, K. (2013). Experiencing connection with nature: The matrix of psychological well-being, mindfulness, and outdoor recreation. Ecopsychology, 5(2), 80–91. https://doi.org/10.1080/14699982.2013.76008

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