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The Psychology of High-Impact Climate Action: Personality Traits, Values, Attitudes, and Motivations as Drivers of Pro-Environmental Behaviour

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Abstract

Climate change has caused an unprecedented threat to eco-systems, necessitating a transition to a low greenhouse gas (GHG) emitting society. An important leverage point is high-impact climate actions; actions with the most potential for reducing GHGs (e.g., avoiding air travel, choosing fossil-free banks), and the drivers behind these actions. Limited studies have applied latent class analysis (LCA) to simultaneously model personality traits, values, attitudes, and motivations to predict engagement in high-impact climate action among participants residing in high-income, liberal democratic countries—those that are disproportionately responsible for GHG emissions ($N = 91$). The present study uncovered three classes based on the psychological variables: Engaged Eco-Conscious (high on openness, honesty-humility, self-transcendence, ecological worldview and autonomous motivation), Self-Focused (low on openness, honesty-humility, ecological worldview and autonomous motivation), and Humble Conventionalist, somewhere between the other classes. Contrary to expectation, Humble Conventionalists reported numerically higher engagement in high-impact climate action compared to the Engaged Eco-Conscious (most psychologically inclined to engage in climate action), though class differences were not statistically significant. Demographic variables, commonly tested in such LCA studies, were also measured. It was found that psychological classes only marginally corresponded with demographics (residence, education, income), indicating that psychological variables by themselves are not sufficient in predicting climate action. This work implies that climate change communication professionals should use targeted messaging for individuals based on their psychological profiles, policymakers should coordinate public campaigns with regulatory changes and financial incentives to address structural elements, and behaviour change designers should address both psychological and structural constraints of individuals.

Keywords: climate action, pro-environmental behaviour, psychological traits, latent class analysis.

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Introduction

Albinia (2010) wrote the following final words in her book on the Indus river, repenting human actions, political and economic, that led to the drying of the river that once breathed life into India and Pakistan:

One day, when there is nothing but dry riverbeds and dust, when this ancient name has been rendered obsolete, then the songs humans sing will be dirges of bitterness and regret. They will tell of how the Indus—which once ‘encircled paradise’, bringing forth civilisations and species, languages and religions—was, through mankind’s folly, entirely spent. (pp. 308-309)

The author’s words capture in literary form what scientists now document empirically: human activity is responsible for erasing millions of years of ecological history, bringing about large-scale environmental challenges. One of these challenges is rapid climate change, an unprecedented crisis that can be attributed directly or indirectly to human-induced changes in global atmospheric levels or the climate, characterised by changes that persist over a long period of time (IPCC, 2021), for example, from the burning of fossil fuels, deforestation, mechanised manufacturing or any other activities that increase the emission of greenhouse gases (GHGs). Manifestations of this climate crisis are evident in accelerating droughts, floods, rising sea levels, and extreme heat events, with wide-spread effects on ecosystems and human well-being (World Meteorological Organisation, 2025). As of November 2025, based on the 2030 and 2035 Nationally Determined Contributions (NDCs) targets (UNFCCC, 2025), the median temperature is expected to be 2.6°C warmer by the end of the century, with a 50% chance of it being higher or lower than this estimate (Climate Action Tracker, 2025).

Given this dire situation, concerted efforts have been made by governments to address the climate change challenge. For instance, in 2015, 196 countries signed the Paris Agreement, committing to limit global temperature rise to well below 2°C above pre-industrial levels (UNFCCC, 2015). While countries are still falling short in terms of set targets (Srouji et al., 2025), one throughline is clear: achieving such targets requires coordinated and urgent action from all levels of society.

A major contributing factor towards the current climate crisis has been the decisions and actions taken by individuals in their daily lives, especially in high-income countries (Wynes & Nicholas, 2017), such as meat-heavy diets, private transport, or unsustainable consumption choices. Thus, interventions targeted towards behaviour change have the potential to bring about rapid transformation in climate action (Whitmarsh et al., 2021), underscoring that the transition to a sustainable future does not rest alone on structural,

systemic changes to policy, institutions and incentives but also on individual behaviour change (Williamson et al., 2018).

This link between transitioning to a low emission society and patterns of individual behaviour has recently brought ‘environmental psychology’ to the forefront of climate discussions. The field studies human-environment interactions, including ways of encouraging pro-environmental behaviour (Steg & de Groot, 2019). Pro-environmental behaviour is defined as goal-directed behaviour that reduces one’s negative impact on, or even benefits, the natural environment (Gatersleben, 2023; Steg & Vlek, 2009), and includes behaviour within such fields as waste management (Raghu & Rodrigues, 2020), energy conservation (Vesely et al., 2022), sustainable consumption (Syed et al., 2024) and biodiversity conservation (van Eeden et al., 2025). A sub-section of these pro-environmental behaviours include climate actions, which are behaviours aimed at reducing GHG emissions specifically¹ (Almeida et al., 2024). It should be noted that most studies within the field of pro-environmental behaviour focus on consumer actions (rather than on citizen or financial actions), that is actions with a low effect at reducing GHG emissions, and often without clear distinction between the action and the desired outcome (e.g., saving water may be classified with climate actions, although it does not meaningfully reduce GHG pollution) (Wynes & Nicholas, 2017; Nielsen et al., 2021; Stern, 2000).

In addressing human-induced climate change, there has been an increasing focus on how personality traits (Soutter et al., 2020), values (de Groot et al., 2018), attitudes (Miller et al., 2022) and individual differences in cognitive-emotional reactions (Cabaços et al., 2026) relate to or predict pro-environmental behaviour. Since individuals differ in their traits, interests, affective states and cultural contexts, they will also have different ways of responding to climate change communication. This calls for evidence-based research that can identify psychological profiles of individuals most likely to take meaningful climate action (Gifford & Nilsson, 2014), to motivate them more effectively.

However, despite significant research progress in promoting pro-environmental behaviour, several critical gaps remain. First, the vast majority of studies have focused on low-to-moderate impact climate actions, such as recycling, reducing waste water, or installing energy-efficient light bulbs, with limited attention on high-impact climate action and a narrow focus on consumption choices but not on other behavioural domains, such as voting or investment behaviour. Wynes and Nicholas (2017) demonstrated that certain lifestyle choices,

¹ The broader pro-environmental behaviour literature is drawn upon because it provides the established predictive evidence base; climate action is the specific outcome of interest because it directly maps onto GHG reduction.

such as living car-free, avoiding air travel, and adopting a plant-based diet, have a higher impact on reducing GHGs (achieving reductions of at least 0.8t CO₂e/year) compared to others like recycling or using cold water instead of warm in the washing machine (which were at least 4 times less effective). Second, there is a large body of research on behavioural barriers and predictors that limit the uptake of pro-environmental behaviour (Bosone et al., 2022; Dioba et al., 2024; Latkin et al., 2023; Vieira et al., 2023), but not enough on behavioural enablers that promote engagement in pro-environmental behaviour.

Finally, there is sufficient research on the role of demographic factors influencing pro-environmental behaviour, but not enough on its interaction with psychological characteristics. For instance, in terms of geography, Scandinavian countries outperform southern European countries on pro-environmental behaviour, possibly because of differences in socio-economic development (Mikula et al., 2021); in terms of gender, women tend to engage in pro-environmental behaviour more than men (about 11%; Nagy, 2025); and in terms of age, young individuals (15-35 years old) tend to have better perception of climate change and higher engagement in climate-friendly behaviours, like higher waste reduction and use of private car alternatives, than older individuals (Skeirytė et al., 2022). Now there is a need for more research on psychological profiles—tools that can classify individuals based on personality traits, values, motivations and attitudes to predict climate action, constituting a set of behavioural enablers. Such psychologically-based frameworks will help us in understanding not only whether people act or what they are acting on, but *why* they do what they do and *who* is most likely to engage in action most impactful for the climate. This knowledge matters not only for researchers, but also for governments, policymakers and behaviour change intervention designers. Taken together, these gaps point to the need for a person-centred, multi-variable approach, one that simultaneously models the psychological constructs known to predict pro-environmental behaviour and applies them to high-impact climate action specifically.

The present study addresses these gaps by employing latent class analysis (LCA) to identify distinct psychological profiles in an international sample. The sample consisted of participants from high income, liberal democratic countries, most of whom had post-secondary education and about half earned over \$38,000 USD a year. The profiles are based on four psychological variables introduced above. These variables were selected because of their significant association with pro-environmental behaviour in the extant literature. In addition, these four constructs were chosen deliberately because they form a hierarchy in linking personal characteristics to behaviour: from stable dispositions (personality traits), to guiding motivational principles (values), to domain-specific evaluative beliefs (environmental

attitudes), to beliefs about why it is important to act for the environment (motivation). Critically, this specific group of variables has not been modelled together for clustering of studied populations.

This study also draws on the demographic eligibility criteria of the SHIFT framework (the Super High-Impact Initiative for Fixing Tomorrow), to examine the relationship between psychological and structural positioning of individuals for climate action. By examining whether LCA-derived psychological classes differ in their rates of SHIFT eligibility, this study aims to determine whether psychological profiling and demographic classification capture overlapping or distinct dimensions of climate action readiness. The purpose for doing this is twofold: one, this will allow for a deeper understanding of how psychological variables map onto demographic profiles and two, it will help determine if psychological profiles offer some additional explanation about climate action beyond demographic profiles alone. To this end, the current study aims to answer the following research questions:

- Do individuals tend to engage in low-impact action more often than high-impact action?
- How many psychological classes will emerge when applying latent class analysis to a combined analysis of personality traits, values, attitudes and motivations in a sample of adults?
- How do members of these psychological classes differ in terms of engagement in high-impact climate action?
- To what extent do the LCA-derived psychological classes correspond with the demographic eligibility criteria of the SHIFT framework?

Before examining how the psychological variables differ in terms of climate action, it was important to understand the distribution of participants that engage in different climate actions. First, consistent with research that low-impact actions are performed more frequently than high-impact ones, it was hypothesized that:

H1: Participants will report engaging in moderate-to-low impact climate actions at a higher frequency compared to high-impact climate actions.

Second, before clustering participants, the number of expected classes was determined. Based on prior audience segmentation studies (Maibach et al., 2011; Orton et al., 2025; Rhead et al., 2018) that found at least four to six psychological classes in their sample, it was hypothesized that with a moderate number of indicators in the current study:

H2: At least four to five distinct psychological classes will emerge from this sample.

Theoretical Background

This section provides the theoretical structure supporting the methods of this study, specifically the rationale behind the next set of hypotheses. Literature supporting the link between the chosen psychological variables and pro-environmental behaviour are presented in the following order: personality traits, values, attitudes, and motivations, with additional literature on environment segmentation models.

Personality traits

Personality traits are representative of a relatively stable set of thoughts, feelings and behaviours (McCrae & John, 1992). In psychology, personality is often measured using the Big Five model consisting of five traits, i.e., openness to experience, conscientiousness, extraversion, agreeableness and neuroticism (Costa & McCrae, 1985). An updated model, HEXACO, made some changes to the existing model and added another dimension: honesty-humility (making it Honesty-humility, emotionality, eXtraversion, agreeableness, conscientiousness and openness). Importantly, HEXACO has been shown to add incremental validity to the original Big Five (Ashton & Lee, 2007; Ashton et al., 2014; Gaughan, 2009). Based on these two models, an extensive meta-analysis, covering about 45,000 participants cross-culturally, found that higher openness to experience was significantly linked to pro-environmental attitudes ($r = .22$) and pro-environmental behaviour ($r = .21$), suggesting that greater cognitive flexibility is associated with pro-environmental behaviour (Soutter et al., 2020). The other highly significant trait was honesty-humility, with a correlation of $r = .20$ with attitude and $r = .25$ with behaviour, reflecting that cooperative tendencies probably lead to pro-environmental behaviour.

Another study established longitudinal effects in this relationship, revealing that changes in personality traits co-develop with changes in pro-environmental attitudes and behaviours throughout the life-span, with concern for the environment increasing with an increase in trait levels of agreeableness and conscientiousness (Hopwood et al., 2021). Such associations are not limited to individual behaviours, but can also be found across national-level aggregates. For example, national levels of agreeableness and openness significantly explained the variance in national environmental performance indices, even after controlling for demographic factors like national wealth and education (agreeableness: $r = .31, p < .05$, openness: $r = .40, p < .05$) (Hirsh, 2014). These findings are further supported by studies that have found links between the Big Five, HEXACO and pro-environmental behavioural (Brick & Lewis, 2016; Luchs & Mooradian, 2012; Markowitz et al., 2012; Panno et al., 2021; Soutter

& Mõttus, 2021; Swami et al., 2011), with openness, agreeableness and honesty-humility consistently emerging as the strongest predictors of pro-environmental behaviour, with mixed evidence supporting the link with emotionality and conscientiousness.

Given this evidence, it is hypothesised that:

H3: Individuals belonging to psychological classes with personality traits including the highest openness to experience, agreeableness and honesty-humility will have the highest rate of self-reported high-impact climate action.

Values

Values have long been used to predict pro-environmental behaviour. Schwartz and Bilsky (1987) summarised the definition of values from various sources and defined it in terms of concepts or enduring beliefs we have about certain behaviours, independent of context, that influence our evaluation or judgement of that behaviour (Allport, 1961; Maslow, 1959; Rokeach, 1973). There are several theories that explain how values influence our behaviour. Developed by Homer and Kahle (1988), the Values-Attitude-Behaviour theory in particular posits that values shape our attitudes (more specific cognitions about objects derived from values), which in turn influence our behaviour (e.g., dietary choices, voting behaviour, financial decisions). This theory significantly predicts a host of pro-environmental behaviour, including sustainable crowdfunding behaviours (Kim et al., 2021), sustainable consumption practices (Činjurević et al., 2023), and the adoption of a plant-based diet (Kim et al., 2020), demonstrating that values have high predictive validity. Another common theory is Schwartz's value theory (1992, 1994), which is a specific categorization of human values, while the Value-Attitude-Behaviour theory is a pathway of how abstract values lead to behaviour. In a recent paper synthesising research, Schwartz (2021) describes values as cognitive representations of three universal human motives (biological, interpersonal and group needs), captured by four higher-order factors organised along two continuums: openness to change vs. conservation, and self-enhancement vs. self-transcendence. The former represents the conflict between independence and self-restriction, while the latter represents conflict between prioritising concern for others vs. the self. Self-enhancement vs. self-transcendence tend to be particularly important in predicting environmental beliefs, norms, and behaviours (Steg & de Groot, 2012). While the Value-Attitude-Behaviour is a strong model for values theory, Schwartz value model was chosen for this study because it offers a more wide and comprehensive mapping of values, with well-validated cross-cultural research.

Given this evidence linking Schwartz values to pro-environmental behaviour, it is hypothesised that:

H4: Individuals belonging to psychological classes with values including the highest self-transcendence will have the highest rate of self-reported high-impact climate action.

Attitudes

An ecological worldview, also broadly known as pro-environmental attitude, reflects individuals' beliefs about the relationship between humans and nature (Dunlap et al., 2000). In the 1970s, Dunlap and Van Liere (1978) conceptualised the new ecological paradigm, which upholds the interdependence of the humans-nature relationship and acknowledges the limitation of resources on the planet, in opposition to the dominant social paradigm about the environment, that upholds human exceptionalism and the belief that human resourcefulness can overcome any environmental limit. Predictably, those who endorse the new ecological paradigm relate negatively to the dominant environmental paradigm. The value-belief-norm theory of environmentalism (Stern, 2000) has been instrumental in highlighting the importance of holding an ecological worldview (new ecological paradigm), stating that our awareness of environmental issues depends on our values and ecological worldviews. The causal mechanism is as follows: environmental concern (biospheric values), welfare of others (altruistic values) and concern for oneself (egoistic values) influence our environmental beliefs, including positive ecological worldviews, which in turn strengthen our personal norms, that is, our internal sense of moral duty towards protecting the environment. These factors together predict engagement in pro-environmental behaviour (Steg & de Groot, 2019). Research studies support these interconnecting relationships and have found that an ecological worldview reliably predicts pro-environmental behaviour, such as dropping litter in the recycling bin (Donmez-Turan & Kiliclar, 2021), buying organic food products (Gatersleben et al., 2014), and a host of other behaviours like policy support, water conservation, energy conservation etc. (Gkargkavouzi et al., 2019).

Given this evidence, it is hypothesised that:

H5: Individuals belonging to psychological classes with pro-environmental attitudes including the highest ecological worldview will have the highest rate of self-reported high-impact climate action.

Motivations

Motivational theories in environmental psychology explain what drives us to engage in pro-environmental behaviours. One common theory employed for this purpose is the self-determination theory (Deci & Ryan, 1985, 1991), which distinguishes between intrinsic motivation, extrinsic motivation, and amotivation. This theory postulates that self-determined or intrinsically motivated behaviour is more easily maintained or regulated in the absence of

extrinsic rewards, leading to more desirable outcomes. It is also the most autonomously motivated state. Intrinsic motivation is what propels an individual to engage in a behaviour for the sole purpose of pleasure or satisfaction, while extrinsic motivation is the driving system behind wanting to gain a positive outcome (like money) or avoid a negative one (like social rejection). Further, there are four types of extrinsic motivation, placed on a continuum, where autonomy increases successively: external regulation, introjection, identification, and integration. Ultimately, an individual who is autonomously motivated is most likely to believe that they have autonomy in taking actions that help them fulfil certain goals, in this case, different types of pro-environmental behaviour, like saving water, using energy efficiently, reducing consumption of fast fashion etc. This theory has successfully predicted a wide range of pro-environmental behaviours, including low meat consumption (Schösler et al., 2014), sustainable festival management practices (Dodds et al., 2022), pro-environmental behaviour at the workplace (Maco & Kwon, 2025), and the success of gamification strategies in addressing pro-environmental behaviours such as water waste, energy use and green mobility (Houdt et al., 2020).

Additionally, this theory is based on the assumption that individuals have an innate tendency to be fully functioning members of their social environment through the fulfilment of needs of belongingness and cooperation. This innate need motivates them to engage in pro-social behaviours, which includes pro-environmental behaviour (Barszcz et al., 2023).

Given this evidence, it is hypothesised that:

H6: Individuals belonging to psychological classes with the highest autonomous motivation will have the highest rate of self-reported high-impact climate action.

Climate action roles beyond consumer

While it has been established which psychological variables predict pro-environmental behaviour most strongly, it is also important to consider which individuals are in the best socio-demographic position to act. Nielsen et al. (2021) argued that individuals who belong to a high socioeconomic bracket majorly contribute to energy-driven greenhouse gas emissions, often disproportionate to other classes, yet are usually not the target group for climate interventions. Similarly, across nations, the distribution of GHG emissions is highly unequal, wherein high income countries from North America and Europe emit 13.4 and 7.5 tCO₂eq/cap respectively, while African and West Asian nations emit 1.7 tCO₂eq/cap on average (Ivanova et al., 2020). The different ways in which high-income individuals can contribute to promoting climate action may be in the form of consumer actions such as lower frequency of flights taken, investor actions such as divestment from funds that support fossil

fuel use, role model actions such as social support for plant-based diets, or citizen actions such as voting for leaders who support strong climate policies.

The SHIFT guide builds on Nielsen et al. (2021), recommending roles as available to individuals based on their demographic profile, using components like country of residence, income, and education. The SHIFT guide specifically takes the following factors into account: the country individuals live in (high-income, liberal democratic), whether they have a post-high school degree, and how much they earn in one year (below or above \$38,000 USD, which is based on the top 10% income cut-off globally to determine the group contributing half of household climate pollution (Chancel, 2022; Oswald et al., 2020). The countries were selected based on having a score of $>.8$ as a liberal democracy according to the V-Dem project at the University of Gothenburg (Nord et al., 2026). The goal was to select participants who in theory had all five climate action roles available to them. The relevance of living in a liberal democratic country is that it gives its residents the advantage of having a political structure that enables climate action that other countries may not provide, such as voting in free and fair elections and gaining attention through independent media. At the same time, receiving higher education and earning over \$38,000 per annum means having access to tools, resources and influence that helps fight climate change.

Demographic and psychological variables both have been found to predict a range of pro-environmental behaviours (Ágoston et al., 2024; Nagy, 2025; Smiley et al., 2022; Xirogiannopoulou, 2026). Given this evidence, it was expected that there would be at least some overlap between psychological and demographic variables:

H7: The LCA-derived psychological classes will at least partially correspond with the three demographic factors used to determine SHIFT eligibility.

Environment Segmentation Models

Audience segmentation is a strategy used by researchers and marketers to divide their audiences into different groups based on certain demographics and/or psychological characteristics. In recent years, climate change scientists and communication professionals have become increasingly interested in how this tool can be adapted for climate action communication. A notable effort in this direction was made by researchers in 2008 when they used a large, nationally representative sample to create an audience segmentation profile consisting of ‘Six Americas’ (Maibach et al., 2011). The six segments of audience were labelled as Alarmed, Concerned, Cautious, Disengaged, Doubtful or Dismissive. These segments included individuals who were very worried about climate change (Alarmed) to individuals who were generally unconcerned and also opposed climate change policies

(Dismissive). A follow-up study validated these six types and found that individuals could be categorized into these groups with 70% accuracy (Leiserowitz et al., 2012). This approach has been implemented cross-culturally, including in countries like India (Leiserowitz et al., 2013), Germany (Metag et al., 2017) and Australia (Morrison et al., 2018).

The primary research technique used to segment audiences is cluster analysis, and this can be done through different methods like k-means clustering or latent class analysis (LCA). For instance, Ramos et al. (2020) clustered participants based on private car and public transport use, environmental attitude, environmental concern, personal norms, and political orientation. One such cluster was of individuals who frequently used private cars, seldom used public transport, had negative attitudes towards car sharing, had centre-right political views, low environmental concern, and were hard to reach through public interventions. Building on this evidence, many studies have employed LCA to predict pro-environmental behaviour based on various psychological measures, like environmental concern (Batoool et al., 2022; Rhead et al., 2018), environmental attitudes (Serio et al., 2026), environmental beliefs, personal norms and values (Kácha et al., 2022), and eco-emotions and self-efficacy (Chen et al., 2026).

The present study

The present study aimed to identify distinct psychological classes in a sample of international adults using a quantitative, cross-sectional survey design, and examine how membership in these classes relates to self-reported engagement in high-impact climate actions. By combining a multi-variable psychological profile approach with a focus on high-impact behaviour specifically, this study makes two novel contributions. First, it moves beyond single-construct predictors to offer a more holistic, person-centred account of what drives climate action. Second, it directly targets a population segment — adults from high-income liberal democracies — whose behavioural choices carry disproportionate consequences for global emissions (Nielsen et al., 2021; Ivanova et al., 2020), yet who remain underrepresented in psychological climate research. Before explaining the methods utilised in the present study, a summary of all the research questions and hypotheses is presented in Table 1 for a quick overview for the reader.

Table 1*Summary of research questions and hypotheses*

Research Questions	Hypotheses
RQ1: Do individuals tend to engage in low-impact action more often than high-impact action?	H1: Participants will be found engaging in moderate-to-low impact climate actions at a higher frequency compared to high-impact climate actions.
RQ2: How many psychological classes will emerge when applying latent class analysis to a combined analysis of personality traits, values, attitudes and motivations in a sample of adults?	H2: At least four to five distinct psychological classes will emerge from this sample.
RQ3: How do members of these psychological classes differ in terms of engagement in high-impact climate action?	H3: Individuals belonging to psychological classes with personality traits including the highest openness to experience, agreeableness and honesty-humility will have the highest rate of self-reported high-impact climate action. H4: Individuals belonging to psychological classes with values including the highest self-transcendence will have the highest rate of self-reported high-impact climate action. H5: Individuals belonging to psychological classes with pro-environmental attitudes including the highest ecological worldview will have the highest rate of self-reported high-impact climate action. H6: Individuals belonging to psychological classes with the highest autonomous motivation will have the highest rate of self-reported high-impact climate action.
RQ4: To what extent do the LCA-derived psychological classes correspond with the demographic eligibility criteria of the SHIFT framework?	H7: The LCA-derived psychological classes will at least partially correspond with the three demographic factors used to determine SHIFT eligibility.

Method

Sample size estimation

In LCA, a sufficient sample size is required to detect significant differences between classes (Sinha et al., 2021). The required sample size depends on multiple conditions, such as number of observed indicators, ability of indicators to differentiate between classes, class size, and model fit, hence there is no fixed lower or upper limit for an appropriate sample size (Nylund-Gibson & Choi, 2018). However, simulations performed by Nylund-Gibson et al. (2007), and Wurpts and Geiser (2014) revealed that when $N = 500$ or $N = 1000$, Information Criteria and likelihood estimates were able to accurately identify correct models. They deem $N = 70$ to not be feasible for meaningful analysis and recommend that $N = 100$ should be interpreted cautiously. These findings are further supported by simulation studies conducted by Finch and Bronk (2011).

Realistically in academic research, many LCA studies have small sample sizes. It has been found that when $N < 300$, the model can still be interpreted reliably (Henson et al., 2007), and Weller and colleagues (2020) suggest that smaller samples may be adequate when the model is simple and there are few indicators and classes. A large sample size is only required when there are many indicators and classes (Nylund-Gibson & Choi, 2018). Based on these guidelines, the present study's sample of $N = 91$ was considered sufficient for a model with a moderate number of indicators and classes.

Participants and Procedure

The survey for the study was distributed through LimeSurvey. It is a free and open-source platform with GDPR compliance (General Data Protection Regulation laws of the European Union). A structured questionnaire was used for data collection, targeting community adults and students residing in the list of countries established at the beginning of the study. Links to the survey were distributed mainly through social communication platforms (emails, WhatsApp, LinkedIn). To ensure that community adults were appropriately represented in the sample, posters with a QR-code for the survey were placed around the city of Lund (e.g., in public libraries). This allowed for the collection of large and varied datasets.

Following the criteria outlined by Nielsen et al. (2021), SHIFT roles were deemed potentially available to participants based on a set of demographic eligibility conditions collected in the survey. Specifically, participants were classified as belonging to the SHIFT-eligible group if they reported: (1) residing in a high-income, liberal democratic country as defined by Nielsen et al. (2021); (2) having completed post-secondary education; and (3) earning above \$38,000 USD per annum. Each participant was coded as either *SHIFT-eligible*

or *not SHIFT-eligible*. The present study did not collect the full battery of behaviour-specific indicators required to assess enactment across all five roles, and therefore tested the SHIFT framework at the eligibility level only.

Ethical clearance (see Appendix A) for the study was gained from the department of psychology, Lund University. Participation was voluntary, informed consent (see Appendix A) was collected and survey responses were anonymised, with no identifying information collected from participants. Lastly, no monetary compensation was offered for participation.

It is important to acknowledge that in research on sustainability and pro-environmental behaviour, it may so happen that survey respondents select themselves for such studies based on their interests and proclivity towards environmental topics. The challenge with such self-selected samples is that the respondent chooses to participate in the study because the study systematically relates to behaviours that are of interest to them, consequently affecting validity estimates (Olsen, 2008). In order to minimise this bias, the distribution message of the survey was kept intentionally vague regarding the purpose of the study. The terms ‘sustainability’ and ‘environmental/sustainable behaviour’ were not used at all, rather respondents were informed that it was a study about people’s everyday choices and behaviours.

Measures

The survey was based on a set of standardized and adapted Likert-scale instruments, with robust reliability and validity estimates measuring personality traits, values, attitudes, and motivations. These particular measures were selected because they were found to be most commonly employed by researchers in linking psychological variables with pro-environmental behaviour (See Appendix A for full list of measures.)

Climate Action (outcome variable)

Individual climate action was measured using a Likert scale indicating the frequency for current actions (1 = Never to 5 = Always), while past climate actions were measured as a categorical variable (Yes/No). The behaviours measured were adapted from the twenty three high-impact climate actions identified by Wynes and Nicholas (2017) and Nielsen et al. (2021). These high-impact actions have a low greenhouse gas emissions rate, especially when compared to mitigation strategies commonly promoted by media and education (e.g., recycling is four times less effective than eating a plant-based diet; Wynes & Nicholas, 2017). Two example items include: “I vote for leaders who make and implement strong climate policies” and “I avoid or cut down on flights”. As a control measure, five items representing moderate-to-low impact climate actions were added, such as, “I regularly recycle” and “I have installed energy-efficient light bulbs” (Wynes & Nicholas, 2017).

Prior to analysis, the climate-action items were grouped into four composite scores. High-impact and low-impact climate actions were created as separate composites, with a further distinction applied to current-frequency items and past-action items, resulting in four composites in total: current high-impact actions (16 items; mean values), current low-impact actions (3 items; mean values), past high-impact actions (7 items; proportion) and past low-impact actions (2 items; proportion). Composites of the four climate actions were computed as the mean of respective items for each respondent, with higher scores reflecting greater frequency (current actions) or greater endorsement (past actions).

Personality traits

Personality traits were measured using the Brief HEXACO Inventory (de Vries, 2013), which is a short 24-item instrument assessing six personality traits based on the HEXACO model of personality: Honesty-Humility, Emotionality, eXtraversion, Agreeableness, Conscientiousness and Openness to experience (Ashton et al., 2004). The Brief HEXACO Inventory was chosen because it has been established to be a reliable and valid measure of personality (Barends & de Vries, 2025; Julian et al., 2022). Personality inventories tend to be long with 10-15 items per trait and 60 in total, with the HEXACO PI-R presenting 100 items (Lee & Ashton, 2018), hence to reduce participant fatigue, a brief measure was chosen.

Values

The Schwartz Portrait Values Questionnaire (Schwartz, 2003), a shorter version of the original 40-item scale developed by Schwartz et al. (2001), was employed in this study. It is a 21 item measure that assesses the four higher-order values (self-enhancement, self-transcendence, openness to change, conservation) along with ten basic values (such as benevolence, universalism, conformity, hedonism etc.). The items are represented as vignettes that briefly describe people and the scale ranges from ‘Very much like me’ to ‘Not like me at all’. For example, “It is important to them always to behave properly. They want to avoid doing anything people would say is wrong.”

Attitudes

The New Ecological Paradigm scale (Dunlap et al., 2000) measures environmental concern and attitudes. Respondents rate 15 items on a scale from ‘Strongly agree’ to ‘Strongly disagree’, such as, “The Earth has plenty of natural resources if we just learn how to develop them” and “The so-called “ecological crisis” facing humankind has been greatly exaggerated.”

Motivations

Participants reported their motivations to act for the environment with the Motivation Towards the Environment Scale (Pelletier et al., 1998). This scale, based on the self-

determination theory, captures intrinsic and extrinsic motivation, as well as amotivation in individuals' behaviour towards the environment. 24 items prompt the respondents to think about why they do something for the environment. For example, "For the pleasure I get in mastering new ways to help" and "For the recognition I get for it from others". For the sake of ease and consistency across the survey, the existing rating scale was transformed from its original 7 ratings ('does not correspond with me' to 'corresponds with me') to a 5 point scale (1 = 'Strongly agree' to 5 = 'Strongly disagree'). While there may be some loss of comparability and validity due to this transformation, Hogenboom (2019) have found the scale to have high internal consistency despite this change in ratings.

Demographics

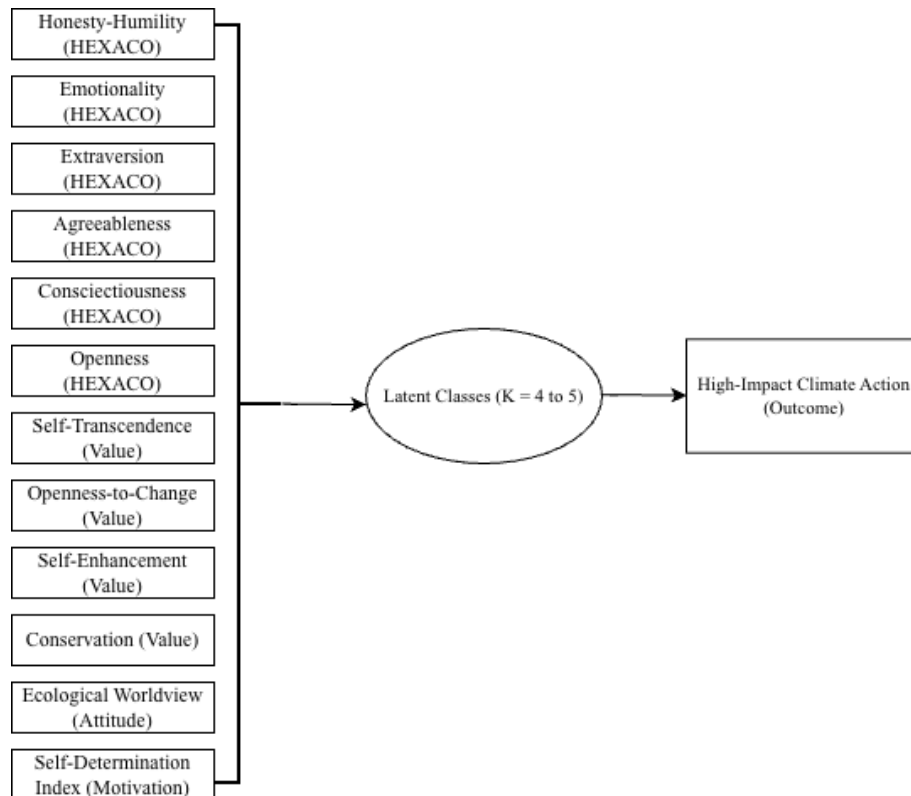
Participants reported their age, gender, education, employment status, country of residence and personal income. The list of countries eligible for this study has been attached to Appendix A.

Analysis strategy

Latent class analysis (LCA) was the primary data analysis technique used in this study. LCA is a type of finite mixture model, also known as an unsupervised learning model, that uncovers "unobserved or unrealized groups (i.e. "latent classes") that exist within a population" (Aflaki et al., 2022). LCA lets individuals cluster together based on natural groupings rather than imposing pre-determined groupings (Collins & Lanza, 2013). The membership of participants in a particular class is determined by variations in the observed variables or "indicators", in this case, personality traits, values, attitudes and motivations. Engagement in high-impact climate action was treated as an outcome variable in this study, meaning it was added in subsequent steps (Figure 1). LCA offers some distinct advantages over k-means and hierarchical clustering (Aflaki et al., 2022), which is why it was chosen as the analysis technique. First, while the latter relies on graphical distances between individuals to create clusters within the data, like the Euclidean distance, the former is a probabilistic model, meaning it identifies likely classes and likely membership of individuals in these classes. Second, LCA is better at managing both types of variables (continuous and categorical) as well as mixed models. Third, LCA is better at managing missing data and various methods exist to address this. For this study, missingness was addressed through item-wise mean imputation prior to analysis, in line with the procedure outlined by Sinha et al. (2021). Fourth, since LCA is model-based, it has the ability to produce fit statistics, allowing for a more statistically robust method of selecting the appropriate number of classes (Goodman et al., 2002).

Figure 1

Conceptual model of the latent class analysis conducted in this study. Observed psychological indicators (personality traits, values, attitudes, and motivation) determine membership in the latent class variable, which was estimated in Step 1. Engagement in high-impact climate action was treated as an auxiliary outcome variable and was related to class membership in Step 2



Prior to analysis, two important considerations had to be made: data missingness and normal distributions. Sinha et al., (2021) recommend that a 10% missing rate is acceptable for LCA, hence the data was first analysed for this and missing values were imputed with means. Participants with more than 10% missing data were excluded from further analysis. Secondly, while LCA itself does not require normal indicators, mixture models tend to perform best with approximately normal, equal-variance inputs (Steinley & Brusco, 2011). Hence, all continuous variables were standardized by being placed on the same z-scale, with the mean being set as 0 and the standard deviation as 1 (Sinha et al., 2021). Because standardisation rescales but does not reshape a distribution, the normality of each continuous variable was assessed independently (see below).

Indicators

The LCA was conducted with twelve indicators representing the four psychological constructs under investigation: the six HEXACO traits (honesty-humility, emotionality, eXtraversion, agreeableness, conscientiousness, and openness to experience), the four higher order dimensions of values (self-transcendence, self-enhancement, conservation, and openness to change), ecological worldview and motivation (self-determination index). The HEXACO traits were examined separately, keeping in line with the theoretical position that each trait represents a different dimension of personality (Ashton & Lee, 2007). The six Motivation Towards the Environment Scale (MTES) subscales were combined into a single Self-Determination Index (SDI), computed as $3 \times \text{Intrinsic} + 2 \times \text{Integrated} + 1 \times \text{Identified} - 1 \times \text{Introjected} - 2 \times \text{External} - 3 \times \text{Amotivation}$ (Pelletier et al., 1998). The weights reflect the autonomy continuum from the theory (Deci & Ryan, 1985), with the most autonomous receiving the highest weight (+3), and the most controlled receiving the lowest weight (-3); higher values on this index reflect a more autonomous motivational profile, meaning individuals who score high on SDI act towards the environment because they are intrinsically motivated to do so. The SDI was preferred over six individual subscales because these subscales are intercorrelated and treating them separately would have introduced redundancy into the model. Also, to maintain a simple-to-moderate model with a small sample size, the six subscales were excluded to reduce the number of estimated parameters. All twelve indicators were standardised to z-scores and then discretised into tertiles (low, medium, high) prior to model fitting in keeping with the standard procedure for applying LCA to continuous psychological data.

Model Selection

The data was analysed in R version 4.4.2. (R Core Team, 2024), using the poLCA package (Linzer & Lewis, 2026). For model estimation, all items were entered into the model and a series of cousin models were run, beginning with a one-class model and then addition of one class at a time. After generating six models, they were compared to each other using statistical criteria to arrive at the best model with an optimal number of classes and fit indices.

To run model comparisons, two most commonly used statistical criteria for LCA models were applied. AIC (Akaike Information Criteria) and BIC (Bayesian Information Criteria) were the key metrics used for selecting the optimal number of classes for model fit. Lower values on these metrics indicate a better fit. In mixed models with both continuous and categorical variables, BIC works better at identifying the best fit, especially when most variables are continuous in nature (Morgan, 2015), which was true in the current case. However,

it is important to note that BIC is also sensitive to small sample sizes, so when the sample size is small, it is advisable to present both BIC and AIC (Sinha et al., 2021). In the current case, AIC was chosen as the primary criteria for model selection because it is better suited for small sample sizes (Sinha et al., 2021). Lastly, entropy statistics were also reported, indicating clarity in class separation.

To assess the quality of class assignments, posterior class-membership probabilities were calculated for each respondent. These probabilities reflect the certainty with which an individual belongs to their most likely class, with higher values indicating better classification.

Overlap with SHIFT roles

To test whether demographic profiles map onto psychological profiles, the first step was to disaggregate the three classes based on age, gender, education, employment and income. Since the demographic variables produced contingency tables in which expected cell counts fell below five, a condition under which the Pearson's chi-square approximation becomes unreliable (Cochran, 1954; Field, 2018), Fisher's exact test with simulated p-values was used in place of the chi-square test. Additionally, for each test, Cramer's V was computed to estimate effect sizes; Cramer's V ranges from 0 to 1 and is interpreted using Cohen's (1988) thresholds adjusted for table dimensions.

Results

Summary of study hypotheses

Table 2 provides a brief overview of study hypotheses as well as a summary of the results that either support or reject them. Overall, only one hypothesis was supported in its entirety (H1) while the others were not supported at all (H2 – H6) or only marginally supported (H7). The next sections elaborate on these results and provide statistical data.

Table 2

Summary of hypotheses, with evidence supporting their rejection or acceptance

Hypothesis	Hypothesis Retention	Evidence
H1: Participants will be found engaging in moderate-to-low impact climate actions at a higher frequency compared to high-impact climate actions.	Supported	Participants reported engaging in low-impact action more than high-impact climate action, both currently and in the past.

H2: At least four to five distinct psychological classes will emerge from this sample.	Not supported	Only three distinct psychological classes emerged through the data: Engaged-Eco Conscious, Humble Conventionalist and Self-Focused.
H3: Individuals belonging to psychological classes with personality traits including the highest openness to experience, agreeableness and honesty-humility will have the highest rate of self-reported high-impact climate action	Not Supported	The Engaged Eco-Conscious class with the highest values on openness to experience, agreeableness and honest-humility reported the second highest engagement in high-impact climate action, after Humble Conventionalists.
H4: Individuals belonging to psychological classes with values including the highest self-transcendence will have the highest rate of self-reported high-impact climate action.	Not Supported	The Engaged Eco-Conscious class with the highest values on self-transcendence reported the second highest engagement in high-impact climate action, after Humble Conventionalists.
H5: Individuals belonging to psychological classes with pro-environmental attitudes including the highest ecological worldview will have the highest rate of self-reported high-impact climate action.	Not Supported	The Engaged Eco-Conscious class with the highest ecological worldview reported the second highest engagement in high-impact climate action, after Humble Conventionalists.
H6: Individuals belonging to psychological classes with the highest autonomous motivation will have the highest rate of self-reported high-impact climate action.	Not Supported	The Engaged Eco-Conscious class with the highest self-determination reported the second highest engagement in high-impact climate action, after Humble Conventionalists.
H7: The LCA-derived psychological classes will at least partially correspond with the three demographic factors used to determine SHIFT eligibility.	Marginally Supported	The three classes only marginally overlapped with SHIFT eligibility–the Humble Conventionalist class was most SHIFT-eligible (had all three demographic variables: residence in a liberal democratic country, post-

Sample Composition

A total of 151 individuals accessed the online survey, out of which 27 were excluded prior to missing-data analysis because they did not provide informed consent or did not reside in one of the eligible high-income, liberal democratic countries. Of the remaining 124 respondents, 33 were excluded for exceeding the pre-specified 10% missingness threshold recommended for LCA (Sinha et al., 2021), yielding a final sample of $N = 91$. Among the retained sample, the missingness was below 5% across the 12 LCA indicators.

The sample was found to be diverse: $M (SD)_{\text{Age}} = 37 (13.2)$ years; 61.5% female; modal education = Bachelor's (31.9%) and Master's (31.9%) degree; 62.6% employed, 29.7% students and 51.6% earning above \$38,000 (USD). The current study had a fairly representative sample, allowing for generalisations to be made about climate action across the following countries: 28.6% Germany, 28.6% Sweden, 13.2% U.S.A and 9.9% U.K (See Appendix B, Table B1 for all figures).

Frequency of engagement in high-impact climate action

As can be clearly seen in Table 3, consistent with H1, respondents reported engaging in low-impact climate actions substantially more frequently than high-impact actions, both currently ($M = 3.84$ vs $M = 2.63$ on a 1–5 scale) and historically (93% vs 33% endorsement). These differences are visualised in Figures 2 and 3 and the results mean that engagement in actions like regularly recycling and installing energy efficient lightbulbs is higher than actions such as voting for political leaders who implement strong climate policies or choosing more sustainable modes of transport.

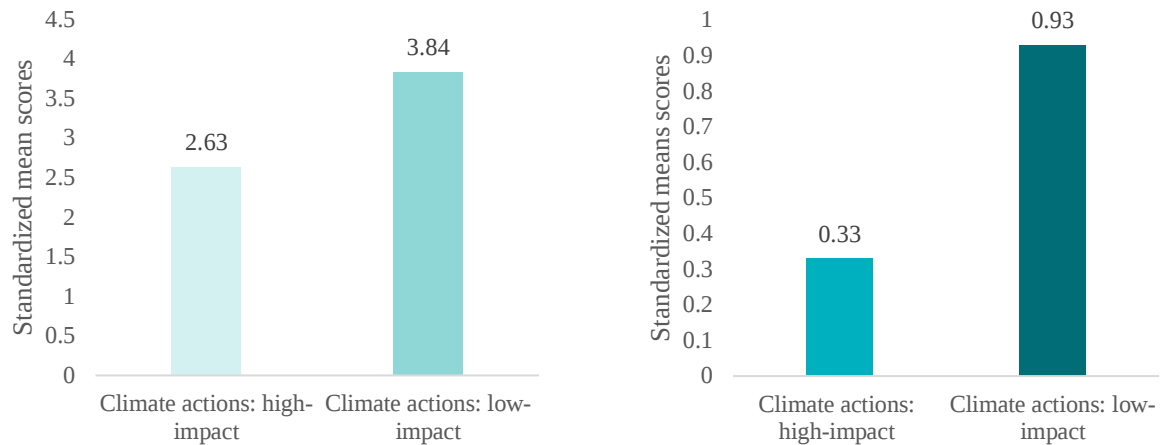
Table 3

Descriptive statistics for all climate action variables

Scale	M	SD	Skew	Kurtosis
Climate actions: high-impact (frequency)	2.63	0.79	0.08	-0.94
Climate actions: low-impact (frequency)	3.84	0.70	-0.47	-0.35
Past climate actions: high-impact (Yes/No)	0.33	0.24	0.74	-0.14
Past climate actions: low-impact (Yes/No)	0.93	0.17	-2.12	2.57

Figures 2 and 3

Figure 2 represents standardized mean scores of engagement in current climate action and Figure 3 represents endorsement of past climate action

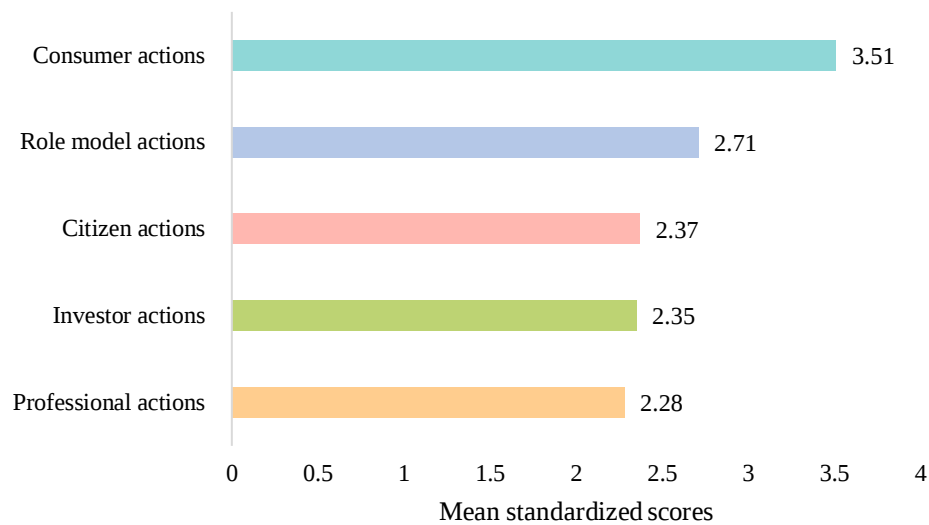


An examination of a subset of individual actions showed that 94% participants reported switching from plastic to canvas bags (low-impact behaviour) compared with 5% who reported having chosen a fossil-free bank (high-impact behaviour) (see Appendix B, Table B2 for all figures). This gap between low-impact and high-impact climate actions is undeniably large. This item-level focus further supports H1.

The data was also disaggregated by the five SHIFT roles. Although Nielsen et al. (2021) developed the framework specifically to draw attention to high-impact climate actions, the framework itself describes the five roles as broad domains of climate-relevant behaviour. Therefore, in the current study the SHIFT roles were used as organising categories for behavioural domains that covered low-impact actions as well. This allows for a more complete description of the behavioural domains in which respondents do or do not engage. Through this analysis, the gap between the different actions was visible, as displayed in Figure 4, and it was evident that consumer actions were the most highly engaged in climate action, followed closely by role model actions and citizen actions (See Appendix B, Table B3 for all figures).

Figure 4

Average values representing engagement in current climate actions, grouped by SHIFT roles



Data analysis prior to LCA model construction

Before commencing with LCA, a descriptive statistical analysis of the psychological variables was conducted to get an overview of sample characteristics. This analysis revealed that honesty-humility and openness to experience scores were higher on average compared to other traits in the sample ($M = 4.07$ and $M = 4.03$ respectively; Table 4). Similarly, self-transcendent and openness-to-change mean values were higher than their counterparts ($M = 5.03$ and $M = 4.04$ respectively). For self-determination, the highest average values belonged to identified ($M = 4.30$), introjected ($M = 3.87$) and integrated ($M = 3.76$) motivation, meaning that this sample was more extrinsically motivated to act towards the environment. These aggregate values already indicated that the current sample would likely be more pro-environmental on average, and that the subsequent classes will align closely with the extant literature.

Table 4

Descriptive statistics for all psychological variables

Psychological variables	Scale	M	SD	Skew	Kurtosis
Personality traits	HEXACO Honesty-Humility	4.07	0.59	-0.78	0.68
	HEXACO Emotionality	2.93	0.62	-0.28	-0.23
	HEXACO Extraversion	3.93	0.62	-0.55	-0.15

	HEXACO Agreeableness	3.03	0.63	-0.23	0.20
	HEXACO Conscientiousness	3.60	0.57	0.04	-0.21
	HEXACO Openness	4.03	0.50	-0.35	-0.35
Values	Self-Transcendence	5.03	0.63	-0.53	-0.65
	Self-Enhancement	3.17	1.02	0.71	0.18
	Conservation	3.43	0.75	-0.11	-0.25
	Openness to Change	4.04	0.86	0.18	-0.74
Attitudes	Ecological Worldview	4.04	0.50	-0.47	0.08
Motivations	MTES Intrinsic	3.56	0.76	-0.71	0.53
	MTES Integrated	3.76	0.87	-0.32	-0.74
	MTES Identified	4.30	0.54	-0.13	-0.85
	MTES Introjected	3.87	1.08	-0.82	-0.33
	MTES External	1.87	0.77	1.16	2.01
	MTES Amotivation	1.83	0.73	0.80	0.14

To support the integrity of LCA, it was important to determine the intercorrelations between all study variables. Since LCA has an assumption of local independence, meaning each indicator should meaningfully capture distinct classes rather than measuring the same thing, it is vital to know how correlated variables are to each other. There is no fixed coefficient estimate for determining when a correlated pair should be eliminated from analysis. Sinha et al., (2021) arbitrarily suggest choosing $r > .5$ as the cut-off point. Higher correlations than this indicate significant overlap between two variables, meaning that it can influence modelling and fit statistics. In line with this, an intercorrelation matrix was computed, including 6 HEXACO traits, 4 higher-order values, new ecological paradigm total, Self-Determination Index and 3 composites of climate actions: high and low impact current actions and high impact past actions (Table 5). The past low-impact composite was excluded from the correlation matrix because it consisted of only two binary items with severe ceiling effects (94% endorsement on canvas-bag use), which would have made the correlation coefficients unstable and thus uninformative.

The strongest inter-correlation was observed between HEXACO honesty-humility and self-enhancement value ($r = -.51$), which may be theoretically expected considering that individuals with humility don't tend to value status and wealth (Ashton et al., 2014; Lee et al., 2010; Visser et al., 2014). Prior analysis had revealed that the six motivation towards the

environment sub-scales had moderate to high correlations ($r = .39$ to $.53$) meaning that they could potentially introduce some redundancy in the model, which is why they were combined to form a single Self-Determination Index (SDI). None of the other intercorrelations met the multicollinearity level, meaning that it was safe to conduct LCA.

Cronbach's alpha was also computed because it establishes the measurement foundation for indicators in LCA—if the indicators do not have appropriate reliability estimates, then any conclusion drawn from the classes can be attributed to measurement error rather than the actual psychological underpinnings of climate behaviour. The alpha values for all HEXACO traits were within an acceptable range with the exception of emotionality ($\alpha = .34$), which was particularly low. This can be explained by the heterogeneity that was deliberately maintained by de Vries (2013). This is to be expected from brief scales like this one because they forgo some internal consistency to maintain breadth of content, capturing distinct facets (fearfulness, anxiety, sentimentality and dependence) to maintain a limited number of items per trait. Emotionality was not excluded from analysis because that would mean compromising on the theoretical underpinnings of the LCA model. Alpha values for the rest of the scales ranged between $\alpha = .61$ to $\alpha = .91$, which is within acceptable limits. The high-impact climate action composite had an alpha value of $\alpha = .91$, which is considered excellent, but the low-impact composite had a lower value ($\alpha = .12$), which is considered poor (Nunnally & Bernstein, 1994). This could be because the scale has not been tested for its psychometric properties and is not unidimensional. Rather, it represents a heterogeneous behaviour index.

Table 5

Intercorrelations among study variables: personality traits, values, attitudes, motivations and climate actions

Variable	α	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Honesty-Humility	.50	-														
2. Emotionality	.34	-.18	-													
3. Extraversion	.61	.08	-.24*	-												
4. Agreeableness	.56	.23*	-.16	.16	-											
5. Conscientiousness	.50	.19	-.20	.17	.10	-										
6. Openness	.40	-.05	-.15	.29**	-.15	.00	-									
7. Self-Transcendence	.61	.12	.04	.16	.16	.18	.28**	-								
8. Self-Enhancement	.76	-.51***	.16	-.11	-.29**	.05	-.04	-.06	-							
9. Conservation	.61	.19	.31**	-.20	.11	.26*	-.19	.13	.14	-						
10. Openness to Change	.72	-.29**	-.15	.21*	-.09	-.06	.33**	.27**	.37***	-.12	-					
11. NEP	.78	.04	.15	-.03	.03	.15	.14	.23*	-.06	.07	.03	-				
12. Self-Determination Index	-	.16	-.08	.28**	.08	.15	.30**	.27**	-.11	-.13	.05	.09	-			
13. High-impact actions (current)	.91	.03	.11	.07	.08	.12	.05	.21*	-.17	-.06	-.10	.37***	.37***	-		
14. Low-impact actions (current)	.12	.17	.02	.08	-.12	.20	.09	.18	-.16	.07	-.06	.17	.21*	.25*	-	
15. High-impact actions (past)	.74	.03	.13	-.07	.08	.06	.03	.28**	-.14	-.05	-.04	.25*	.30**	.75***	.21*	-

Note. N = 91. Cronbach's alpha values appear in the second column. Variables 1-6 are HEXACO personality traits; variables 7-10 are Schwartz higher-order values (PVQ-21); variable 11 is the New Ecological Paradigm total; variable 12 is the Self-Determination Index from the MTES (alpha is not reported as the SDI is a weighted composite of motivation subscales). * $p < .05$, ** $p < .01$, *** $p < .001$.

The theoretical predictors in this study were assumed to be normally distributed. Even though most of them did not meet formal normality (Shapiro-Wilk $p > .05$; Shapiro & Wilk, 1965), their skewness and kurtosis (Table 3 & 4) ranges fell within limits that are considered acceptable (Ghasemi & Zahediasl, 2012). Some were clearly normally distributed, for instance HEXACO conscientiousness ($p = .167$), while others were non-normal, for instance self-enhancement value ($p = .002$), but not severely non-normal with their skewness and kurtosis within acceptable ranges of < 2 for skewness and < 7 for kurtosis (Kline, 2016), for instance self-enhancement value had the following values: skew = .71 and kurtosis = .18.

LCA model construction

After ensuring that all assumptions of LCA were met, the main analysis was conducted. The 6 models that combined all psychological variables were estimated simultaneously (Table 6). As mentioned in the methods section, to select the best model, Akaike Information Criteria (AIC) was primarily taken into consideration. Accordingly, AIC was the lowest at $K = 3$ (2358.7) and hence was the best fitting model. BIC was lowest at $K = 1$ (24443.97), then increased monotonically. Entropy, ranging from 0 to 1, indicates how well classes are separated in a sample. At $K = 3$ the entropy was .87 and any value above .80 is considered to have passed the threshold for good class separation (Sinha et al., 2021). Weighing both the AIC and entropy values together, the most meaningful class separation was at $K = 3$, with the lowest AIC values and high entropy values. Additionally, the smallest class size for classes with higher entropy values was not large enough to draw any meaningful conclusions about the psychological characteristics in this sample ($K = 4$, 11% and $K = 5$, 12%).

Table 6

Model Fit Statistics for Latent Class Solutions ($K = 1-6$)

K	Log-likelihood	AIC	BIC	Entropy	Smallest class %	Parameters
1	-1167.86	2383.71	2443.97	-	100.0	24
2	-1133.32	2364.64	2487.68	.953	28.2	49
3	-1105.38	2358.77	2544.57	.869	22.2	74
4	-1081.55	2361.11	2609.68	.932	11.0	99
5	-1063.17	2374.35	2685.69	.924	12.1	124
6	-1042.75	2383.49	2757.61	.963	10.0	149

Note. $N = 91$. K = number of classes; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion. Lower AIC and BIC values indicate better fit. Entropy ranges from 0 to 1, with values $\geq .80$ indicating good class separation. The $K = 3$ solution was selected based on AIC, entropy, and class-size considerations.

The smallest class that emerged at $K = 3$ was 22.2%, which is well above the 5% rule of thumb. Thus, H2 was not entirely supported: not four to five, rather three distinct classes emerged through LCA.

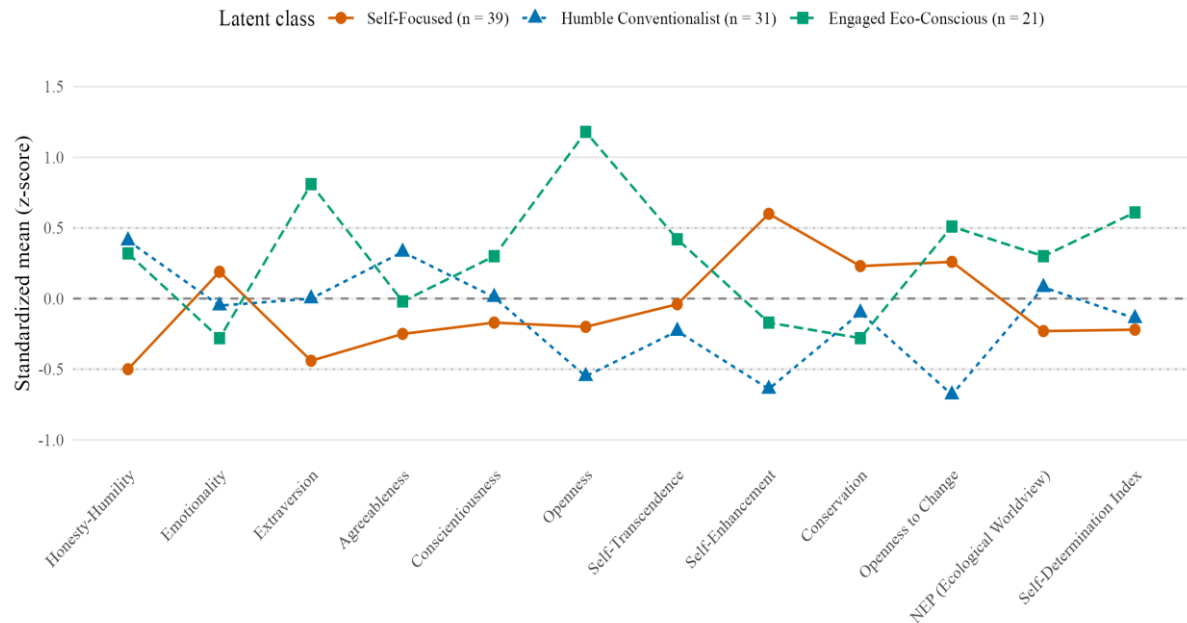
LCA model labels

Based on differences in mean scores, and acceptable distribution of posterior-class membership, the three classes were assigned labels that meaningfully distinguished between their characteristics: Self-Focused, Humble Conventionalist and Engaged Eco-conscious.

The differences in psychological patterns can be interpreted as follows (Figure 5; see Appendix B, Table B4 for all figures). First, the Self-Focused group ($n = 39, 42.9\%$); this group constituted the largest class and was low on honesty-humility ($M = -0.50$), high on self-enhancement ($M = 0.60$), low on extraversion ($M = -0.44$), low on ecological worldview ($M = -0.23$) and low on self-determination index ($M = -0.22$) compared to other classes. The group appeared to have a status/achievement orientation and reported low concern for the environment. Second, Humble Conventionalist ($n = 31, 34.1\%$): this group scored high on honesty-humility ($M = 0.40$) and agreeableness ($M = 0.33$), low on openness ($M = -.55$), low on self-enhancement ($M = -0.64$) and low on openness to change ($M = -0.68$) compared to other classes. Participants belonging to this group can be considered modest and cooperative, but not psychologically inclined towards novelty or transformation. They also had average scores on ecological worldview, meaning that they are not particularly anti-environment either. Third, Engaged Eco-Conscious ($n = 21, 23.1\%$): although the smallest group, this set of participants appeared to be the most psychologically inclined to engage in climate action—high on openness ($M = 1.18$), high on extraversion ($M = 0.81$), high on self-transcendence ($M = 0.42$) and openness-to-change ($M = 0.51$), high on ecological worldview ($M = 0.30$) and self-determination index ($M = 0.61$). Mean agreeableness scores did not appear to be significantly different across the three classes.

Figure 5

Standardized mean scores on each LCA indicator by latent class (K = 3)



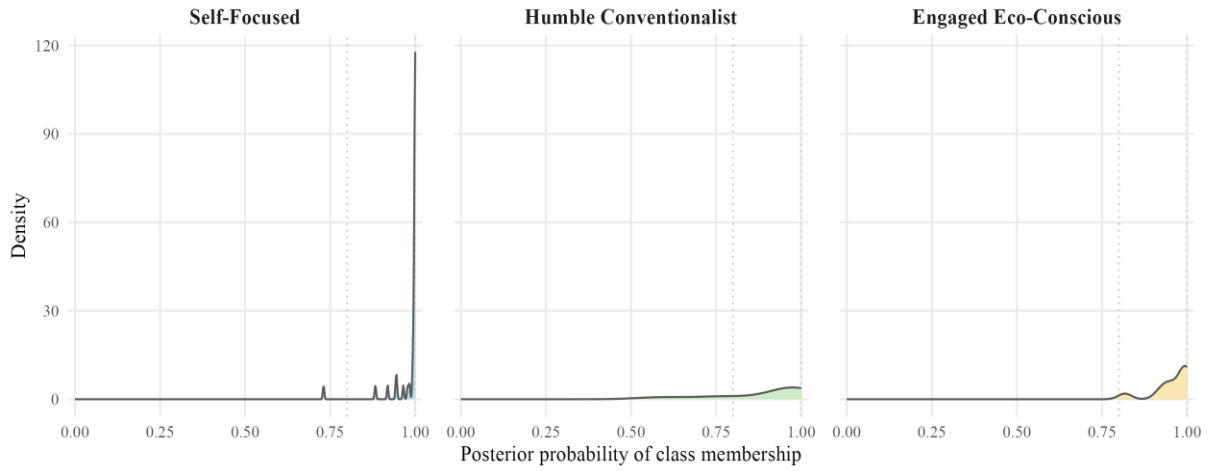
Note. Cell values are class specific z-scores; horizontal dashed line is the sample mean ($z = 0$); dotted lines mark ± 0.5 SD as a reference for meaningful deviation.

Posterior Probabilities

Figure 6 displays the distribution of posterior class-membership probabilities for the three-class latent class solution ($N = 91$). Posterior probabilities were concentrated near 1.0 for the Engaged Eco-Conscious class ($\approx .95$) and Humble Conventionalist class ($\approx .90$), indicating high classification confidence. The Self-Focused class showed lower average posterior probabilities ($\approx .70$), suggesting greater ambiguity in class assignment for these respondents. This could be because Self-Focused members may share characteristics with Humble Conventionalists or Engaged Eco-Conscious respondents. Nevertheless, no respondents exhibited probabilities below .60 for their modal class, and the overall entropy of .87 supports the adequacy of the three-class solution. Based on these results, modal class assignment was used for subsequent prediction of the outcome variable.

Figure 6

Distribution of posterior class-membership probabilities for the $K = 3$ latent class solution ($N = 91$)



Note. Each panel shows the distribution of posterior probabilities of class membership for respondents whose most likely (modal) class was the class shown. Higher values reflect greater classification confidence; mass concentrated near 1.0 indicates high-confidence assignment, consistent with the overall entropy of .87 reported for the three-class solution.

Prediction of engagement in high-impact climate action

The next step in the analysis was to determine if these psychologically distinct classes could actually predict pro-environmental behaviour, specifically high-impact climate action. To this end, a one-way ANOVA was employed, with latent class membership entered as the between-subjects factor (Table 7). Contrary to H3, H4, H5 and H6, the three psychological classes did not differ significantly in their engagement with high-impact climate action, $F(2, 88) = 0.95$, $p = .390$, $\eta^2 = .021$. The Engaged Eco-Conscious class ($M = 2.74$) reported only marginally higher engagement than the Self-Focused class ($M = 2.50$) on the frequency scale, with the Humble Conventionalist class falling between these two ($M = 2.72$). Similar patterns were observed for past high-impact climate actions, $F(2, 88) = 1.13$, $p = .327$, $\eta^2 = .025$, and for past low-impact actions, $F(2, 88) = 0.19$, $p = .823$, $\eta^2 = .004$. The closest result to conventional significance was for current low-impact actions, where the Engaged Eco-Conscious class reported somewhat higher frequencies than the other two, $F(2, 88) = 2.82$, $p = .065$, $\eta^2 = .060$, reflecting a small-to-medium effect that did not reach statistical significance.

Tukey HSD (honestly significant difference) post-hoc tests confirmed that no pairwise comparison between classes reached significance for any outcome (all $p_{adj} > .05$). Together, these results indicate that despite clear psychological differentiation between the three classes, this differentiation did not translate into corresponding differences in self-reported high-impact climate action. Hence, H3, H4, H5 and H6 were rejected.

Table 7*Climate action engagement by latent class*

Outcome	Self-Focused (n = 39)	Humble Conv. (n = 31)	Engaged Eco. (n = 21)	F	df	p	η^2
High-impact actions (current frequency, 1-5)	2.50 (0.76)	2.72 (0.86)	2.74 (0.74)	0.95	(2, 88)	.390	.021
Low-impact actions (current frequency, 1-5)	3.68 (0.78)	3.83 (0.65)	4.13 (0.54)	2.82	(2, 88)	.065	.060
High-impact actions (past, proportion)	0.28 (0.22)	0.36 (0.28)	0.36 (0.23)	1.13	(2, 88)	.327	.025
Low-impact actions (past, proportion)	0.92 (0.18)	0.93 (0.17)	0.95 (0.15)	0.19	(2, 88)	.823	.004

Note. N = 91. Cell values for class columns are M (SD). F-values are from one-way ANOVAs comparing classes; η^2 (eta-squared) values of .01, .06, and .14 represent small, medium, and large effects (Cohen, 1988). No outcome reached $p < .05$.

Overlap between the psychologically-derived LCA classes and SHIFT eligibility

Table 8 shows that none of the categorical demographic comparisons were statistically significant (gender, $p = .366$; education, $p = .744$; employment, $p = .888$; country, $p = .614$; income, $p = .233$). The SHIFT-eligibility analysis was conducted using Pearson's chi-square this time because the cell counts were sufficient. This analysis produced marginally non-significant effects of medium magnitude ($\chi^2(2) = 4.68$, $p = .096$, Cramer's $V = .227$). The SHIFT-eligibility differed across the three classes: 33% of the Self-Focused were SHIFT-eligible, compared with 58% of the Humble Conventionalist class and 52% of the Engaged Eco-Conscious class. The Humble Conventionalist class, characterised by low openness, low openness-to-change, and average ecological worldview, was the most SHIFT-eligible group (58%), while the most psychologically engaged class (Engaged Eco-Conscious) was only 52% SHIFT-eligible. Here it is important to note that Humble Conventionalists were the most SHIFT-eligible group numerically, but this difference was not actually statistically significant, only approaching significance ($p = .096$). There was a 25 percentage-point gap between the Self-Focused and Humble Conventionalist classes, suggesting that the SHIFT framework does discriminate meaningfully to a certain extent between certain psychological profiles even where individual demographic markers do not. This means that H7 was only marginally supported.

The vast majority of participants in all three classes had post-secondary education, meaning that income was the main variable that kept some participants out of SHIFT eligibility.

In the Self-Focused class for instance, 59% reported earning less than \$38,000 a year. The Humble Conventionalists on the other hand, the class with numerically highest engagement in high-impact climate action, had the largest proportion of participants who met the income eligibility criteria (64%). This could potentially be because individuals with higher income have the financial resources to shop more, afford more flights or use a private car, and hence overconsume, meaning there is more possibility for engaging in behaviours that cut down on emissions. Individuals with lower income on the other hand have less need to reduce consumption since they cannot afford most high-emission reducing activities.

Table 8

Demographic Profile by Latent Class

Variable	Self-Focused (n = 39)	Humble Conv. (n = 31)	Engaged Eco. (n = 21)	Test statistic	p	Effect size
Age, M (SD)	34.63 (11.40)	41.04 (16.18)	35.76 (10.97)	F(2, 81) = 2.00	.142	$\eta^2 = 0.047$
Gender (% Woman)	55.3%	75.9%	65.0%	Fisher (sim.)	.366	-
Post-secondary education (%)	82.1%	87.1%	90.5%	Fisher (sim.)	.744	-
Currently employed (%)	56.4%	71.0%	61.9%	Fisher (sim.)	.888	-
Income $\geq$ \$38,000 (%)	41.0%	64.5%	52.4%	Fisher (sim.)	.233	-
SHIFT-eligible (% Yes)	33.3%	58.1%	52.4%	$\chi^2(2) = 4.68$	.096	V = 0.227

Note. N = 91. Continuous variables show M (SD); categorical variables show % within class. F-values are one-way ANOVAs; χ^2 are Pearson chi-square tests; Fisher (sim.) indicates Fisher's exact test with simulated p-values, used when expected cell counts were < 5 . SHIFT-eligible defined as post-secondary education + income $\geq$ \$38,000 (per Nielsen et al., 2021).

Discussion

The aim of this study was to examine systematic differences between individuals based on a comparable set of psychological characteristics and demographic factors using probabilistic modelling, all while focussing on an understudied sample: individuals from high-income, liberal democratic countries. The main findings from this research were as follows: a) in this sample, individuals tended to engage more in low-to-moderate impact climate action versus high-impact climate action, b) a latent class analysis resulted in three meaningfully distinguishable classes of individuals based on openness to experience, honesty-humility, self-transcendent values, ecological worldviews and pro-environmental motivation (Self-Focused, Humble Conventionalist and Engaged Eco-Conscious), c) contrary to expectation, these classes were

unable to significantly predict self-reported engagement in high-impact climate action, d) the Humble Conventionalists emerged as the most SHIFT-eligible class, followed by the Engaged Eco-Conscious class, meaning that these participants met all SHIFT eligibility criteria (residence in a liberal democratic country, post-secondary education and income over \$38,000 USD).

Replicating the action-impact gap

In terms of engagement in individual climate action, it appears that behaviours that are quick and easy to engage in (such as using cold water instead of hot during a wash cycle) overtake behaviours that are actually impactful but require more effort and commitment (such as adopting a plant-based diet). Additionally, it was also found that engagement in consumer actions, arguably easier to commit to, was the highest compared to other actions such as those related to investors or citizens. In a recent study, McCormick et al. (2023) surveyed respondents from the United States about various climate actions and found a similar pattern of results—the frequency of engagement in everyday actions, such as buying environment-friendly products (93%) or talking to friends about threats to the environment (80%), was much higher than advocacy (or political) actions, such as contacting government officials to urge them to take action to reduce climate change (29%) or joining/volunteering with an organisation working to protect the environment (28%). In a Canadian sample, a similar pattern of results emerged, wherein there was high engagement in low-impact actions like consumer green behaviour (88%), composting of food waste (84%) and recycling of electronics (45%) (Lee & Khan, 2020). Earlier work by Preisendörfer (1992) proposed that environmental attitudes can only translate into low-cost actions like recycling that demand little time, effort, or money and are too weak on their own to drive high-cost changes such as transportation reform. Asutay et al. (2023) supported these results by finding that low-impact actions produce more positive affect and are perceived as easier to engage in which results in their higher adoption. However, recent findings from Rhead et al. (2018) complicate this picture by showing that pro-environmental concern can in fact motivate high cost behaviours, such as taking fewer flights. This calls for more research investigating how, and why, psychological tendencies like environmental attitudes influence engagement in high-impact behaviour.

Psychological classes and their agreement with literature

Turning from behaviour to the psychological characteristics underlying them, LCA testing the second hypothesis uncovered three psychological classes. These results aligned well with what prior studies have found: those who tend to be honest and humble, open to new experiences and hold self-transcendental values also tend to have an ecological worldview and higher self-determination towards the environment (Engaged Eco-Conscious; Poortinga &

Darnton, 2016; Soutter et al., 2020). This may be because openness is associated with intellectual curiosity and a preference for novelty. Therefore, individuals who are high on openness-to-new-experiences may also seek knowledge about environmental issues. Honest-humility is associated with a preference for fairness, greed avoidance and pro-social behaviour (Fang et al., 2019; Lawn et al., 2022; Schild et al., 2020; Heck et al., 2018), which may in turn lead to valuing sustainable, regenerative practices over exploitation of the environment.

On the other end were participants who scored low on honesty-humility and openness, high on emotionality, and high on self-enhancement values. In conformity with previous studies, this group, labelled ‘Self-Focused’, had the lowest endorsement of an ecological worldview (Brick & Lewis, 2016; Gatersleben et al., 2014; Hirsh et al., 2014; Markowitz et al., 2012; Stern, 2000). Unsurprisingly, individuals who do not display much intellectual curiosity or challenge to authority are more likely to support the status quo and avoid adopting lifestyle changes that could protect the environment. Similarly, being exploitative and not altruistic can translate to more anthropocentric views. These links between personality traits, ecological worldviews and motivation towards the environment are clearly established in this study.

The last group (Humble Conventionalist) fell somewhere in between the other two: it was comparable to the Engaged Eco-Conscious on honesty-humility, but lower than average on openness and self-transcendent values. While their endorsement of an ecological worldview was high, their value of openness-to-change and belief in self-determined action was higher than the Self-Focused group, likely meaning that while they display a pro-environmental attitude, they do not believe they have the tools to make changes to protect the environment. Overall, the second hypothesis was not supported: instead of four to five distinct classes, only three classes emerged, though it is worth mentioning that a narrow segmentation like this is acceptable for smaller sample sizes (Henson et al., 2007).

Most importantly, the three classes can be easily qualitatively distinguished from one another: Self-Focused (status-oriented), Humble Conventionalist (modest, low-openness), and Engaged Eco-Conscious (open, self-transcendent, autonomously motivated). This is largely consistent with literature that has employed cluster analysis and latent class techniques to arrive at similar group structures. For instance, Rhead et al. (2018) discovered four classes organised on the basis of pro-environmental attitudes about recycling, travel, food and household consumption: Pro-environmental (28.7%, characterized by highest agreement with pro-environmental statements), Neutral Majority (36.6%, characterized by fairly positive cognitive evaluation of the environment), Paradoxical (16.1%, characterized by contradictory agreement with statements), and Disengaged (18.6%, characterized by lowest probability of agreeing with

pro-environmental statements). A socio-demographic analysis of the classes showed that the Disengaged group had older, lower income participants and more men compared to the Paradoxical class. The authors acknowledged that the Paradoxical class was very similar to the previously discovered Doubtful class in the six Americas classification (Maibach et al., 2011). The Pro-Environmentalists had the highest odds of engaging in pro-environmental behaviour, meaning higher environmental concern was more likely to lead to pro-environmental behaviour, such as taking fewer flights, cutting down on water use, reducing food waste (*note: as in most studies, the vast majority of behaviours assessed were low-impact with the exception of flights taken*).

Other similar patterns have been observed across literature based on attitude-behaviour relationships, reflecting systematic differences in pro-environmental behaviour, perceived behavioural control, environmental attitudes, attitudes towards environmental behaviours, subjective environmental norms and environmental knowledge across EU countries (Aral & López-Sintas, 2023). Socio-demographic differences reflected that the most psychologically engaged group was well-positioned—high education and income levels, while the least engaged group was on the opposite end of the spectrum—low education and income levels. The findings from the current study agree and disagree with the literature in one important way: psychological differences between classes overlap significantly with previously discovered classes, however, the differences in socio-economic patterns and prediction of engagement in high-impact climate action do not.

Psychological alignment without engagement in climate action: the value-action gap

This disagreement is precisely where the present results depart most sharply from prior expectations. The Engaged Eco-Conscious class — high on openness, honesty-humility, self-transcendence, ecological worldview, and self-determined motivation — engaged in high-impact action only marginally more than the Self-Focused class. The pattern of psychological leanings in this study suggest that personal factors alone are not enough to explain environmental or non-environmentalist behaviour.

These findings could be explained by the well-documented value-action gap in climate psychology (Grandin et al., 2021; Hoffmann et al., 2024; Pierre et al., 2025; Vieira et al., 2023; Wang & Mangmeechai, 2021), which entails that individuals often intend to engage in certain behaviours but that intention does not necessarily translate to actually taking action towards that behaviour. One may intend to reduce food waste in the household but structural (cheaper to discard food) or psychological (lack of planning) barriers may prevent them from doing so. Additionally, considering that this was an international sample, there may be some country-level

differences that explain the results, but were not explored because they were not a part of the aim of this study. Nevertheless, an important implication here is that personality traits, values, attitudes, and motivation may help identify who could possibly engage in high-impact action, but they cannot determine who actually ends up engaging in this action.

The last hypothesis of the study was marginally supported: there was a slight overlap between the SHIFT eligibility and psychological classes. The marginal correspondence between LCA classes and SHIFT eligibility suggests that psychological and demographic frameworks capture some overlapping but non-identical variance. Crucially, *the most SHIFT-eligible class (living in a liberal democratic country, having post-secondary education and having income over \$38,000) was not the most psychologically engaged one*. The Humble Conventionalist class outranks the Engaged Eco-Conscious class. This means that demographic positioning (income, education) and psychological readiness do not co-vary as much as initially expected. A "ready but constrained" subgroup (psychologically engaged, demographically less eligible) and an "able but uninterested" subgroup (demographically positioned, psychologically reluctant) emerged.

Implications for behaviour-change intervention design

These findings have vital implications for behaviour change intervention design. First, considering that only a small proportion of participants engage in high-impact climate action, public communication campaigns have a paramount opportunity to treat low-impact actions as a baseline rather than a target, and shift messaging effort towards making high-impact actions more visible and normative. Additionally, policy changes at both the national and international level are required to reduce behavioural barriers towards these high-impact actions.

Addressing structural and contextual barriers. There are several barriers that have to be taken into account when studying climate action: structural, contextual, and infrastructural. Qualitative studies, compared to survey-based research, offer a more in-depth perspective on what stands in the way of individual climate action. One such review of 38 qualitative studies identified the role of external barriers that obstruct climate action, for example, economic (the cost of sustainable alternatives, such as, lengthy return on investment periods), institutional (lack of governmental or organisational support, such as, poor transport connections) and socio-cultural (influence of social roles, such as, the social expectation to take part in barbeques where meat consumption is common) (Dioba et al., 2024). The internal barriers included finding change unnecessary because climate change is not perceived as an imminent threat, having conflicting goals or believing that one is already doing enough for climate change so no new actions are required (tokenism). What is important to note is that none of these barriers exist in isolation, rather they intermingle to produce complex barriers to behaviour. Other studies have

also found a mix of barriers and catalysts to behaviour change, such as structural barriers like lack of resources (time and money) and personal barriers like low self-efficacy, disappointment and hopelessness (Quimby & Angelique, 2011).

As H3-H6 produced null results, indicating that even the most psychologically inclined class was not engaging in high-impact climate action enough, it is important to note that interventions that target psychology in isolation are insufficient. To bring about meaningful engagement climate action, it is important to bring about structural changes as well, which require effort from both individual and public actors. A recent meta-analysis found that climate mitigation interventions targeted at social comparisons ($d = 0.37$; psychological; highlighting other individuals' pro-environmental behaviours) and financial incentives ($d = 0.31$; structural; financial rewards, unit pricing programs) were most effective in bringing about behaviour change (Bergquist et al., 2023).

Matching interventions to class-specific barriers. Building on the broader case for combined structural and psychological approaches, the present three-class structure suggests that the type of intervention needs to be matched to the kind of barrier each class faces. Therefore, for the class of participants that are psychologically ready but structurally constrained, that is those who are not entirely SHIFT-eligible and were likely limited by financial barriers (Engaged Eco-Conscious), interventions should focus on lowering structural barriers, such as simple divestment platforms, plant-based food infrastructure, environmentally aligned employer benefits etc. For instance, a case study showed how sustainable consumption practices (though not climate practices) were promoted in relation to antifouling products and services in a Swedish boat club by introducing changes at three levels: government, county and club (Solér et al., 2020). At the governmental level, the Swedish agency for water management ended the use of biocide-based (toxic) antifouling paints, offered sustainable alternatives at highly subsidised rates (financial incentive) and invested in boat washers. The Stockholm county and club implemented this rule, which resulted in over 90% of boat owners choosing not to use toxic paint and switching to sustainable alternatives because of the availability of and investment in boat wash. Adherence to this rule was influenced by peer behaviour (social comparison) because violation of the new rules resulted in exclusion from the club. This is a clear example of how policy, infrastructural and psychological changes were matched to produce sustainable consumption behaviours.

A recent review by Hirth et al. (2023) delineates shallow and deep structural barriers that impede pro-environmental behaviour. Shallow barriers are those that are elastic and can be altered without significant overturn in power, such as, policies (e.g. the insufficiency of the Paris

Agreement in addressing climate change), pricing (expensive renewable energy sources), and technology (negative emissions technology not sufficiently addressing certain risks like carbon capture options). Deep barriers are harder to change and involve alterations in power relations which may be more difficult to achieve, for instance, power dynamics between political actors (e.g., ‘left’ and ‘right’ wing politicians) and unsustainable levels of consumer demands. Some easing of such structural barriers has the potential for making engagement in high-impact climate action easier for those who lack resources.

On the other hand for those that are structurally able but psychologically resistant or reluctant (Humble Conventionalists), interventions should focus on reducing perceived novelty and risk, leveraging behavioural science tools such as social-proofing interventions (“most of your co-workers/neighbours have switched to...”), injunctive norms, nudging etc.

Behavioural-science frameworks for designing interventions. These class-specific recommendations can be operationalised through behaviour-change frameworks. There are some prevalent frameworks in the field of behavioural science that can make behaviours stick, such as the EAST framework (Behavioural Insights Team, 2014) which suggests that in order to change any behaviour, you have to make it Easy, Attractive, Social and Timely. Several studies have applied this framework to change a host of behaviours, such as, air quality information seeking among outdoor workers (Anderson et al., 2026), use of public transport ticket (Bissel et al., 2026), and electricity conservation (Liebe et al., 2021). Several other similar frameworks exist that have proven work in the environmental context, for example, COM-B (how Capability, Opportunity and Motivation generate behaviour; Michie et al., 2011) and MINDSPACE (robust effects on behaviour change: Messenger, Incentives, Norms, Defaults, Priming, Affect, Commitments and Ego; Dolan et al., 2012). All three frameworks represent different things: EAST refers to aspects of behaviour that can be easily targeted, MINDSPACE captures generalisations about behaviour, and COM-B is mostly used for intervention development, evaluation and evidence synthesis. Depending on the goal, any of these frameworks can be adopted.

Tailoring messages to each class. Finally, it is important to frame messaging for target groups based on their differing motivational levers because prior work has found that value-based messages aligned with existing values of individuals are more effective than a one-size-fits-all approach (Bain et al., 2012; Wolsko et al., 2016). For the Self-Focused class, messages could be framed in terms of high-impact actions leading to more what this class already values, that is, self-enhancement (leadership, achievement, status). High-impact behaviours like investing in clean technologies can be framed as highly distinct behaviours that sets one apart

from the rest. This may appeal to them more than environmental concern. For the Humble Conventionalists, community, tradition and being a “good citizen” could be emphasized. Framing climate action as something that promotes a sense of community can reduce resistance. This is supported by research that has found that morally grounding messages can be effective for audiences who do not respond to traditional “harm-and-care” framings (Feinberg & Willer, 2013). Lastly, for the Engaged Eco-Conscious class, which is already motivated, messages should focus on taking action and concrete pathways that lead to that action instead of emphasis on environmental concern.

Across all three classes, these tailored messages should be paired with structural changes and interventions, since psychological predispositions alone don’t always predict engagement in high-impact climate action.

Strengths, Limitations and Future Directions

Segmentation research can be costly (because of the large sample sizes) and may lead to the stigmatization of certain groups, especially if the grouping of individuals is guided by social constructs. To avoid using abstract questions to categorize individuals, the current study started out with clearly set research questions and hypotheses, using theoretically derived constructs to guide indicator selection but then allowing the models be data-driven.

However, conclusions from this study must be drawn cautiously considering the small sample size. Currently, there is no agreement amongst researchers on what the ideal sample size is for LCA so there have been differing recommendations—Weller et al. (2020) suggest at least 300 while Nylund-Gibson and Choi (2018) and Sinha et al. (2021) recommend at least 500. Nevertheless, the current study did not meet standard recommendations, hence interpretations and extrapolations based on this dataset are limited. The statistical power for detecting small-to-medium effects in three group comparisons was limited because the study was underpowered, but several results (like low-impact frequency by class, $p = .65$; SHIFT eligibility by class, $p = .096$) are suggestive of real but underpowered effects. Moreover, it has been found that the sample size tends to correlate with the number of classes observed (Sorgente et al., 2025), meaning that it is possible that with a larger sample size, these indicators would produce more classes, perhaps four to five as hypothesized at the beginning of the study.

Generalisations made from this study are also limited because while the sample drew from fourteen countries, Germany, Sweden and the United States were over-represented. This skew towards Northern Europe culture and policy contexts limits interpretation of results in other high-income, liberal democratic countries. For instance, Japanese participants, on the list of eligible countries, may have produced different and comparable results because of a completely

different cultural context. The country-level chi-square test produced low expected cell counts, hence, this test could not be conducted.

It is recommended that inferential relative fit indices be reported when conducting LCA, such as Vuong-ho-Mendell-Rubin likelihood ratio test (adjusted VLMR) and the bootstrap likelihood ratio test (BLRT) (Sorgente et al., 2025). It is also recommended that all commonly used indices, such as, AIC, BIC, SABIC and AWE be reported for comparison to select the best fit model. Since poLCA package does not natively compute VLMR and BLRT, it was not possible to conduct this analysis. These tests originated in and are most cleanly implemented in Mplus (Muthén & Muthén, 1998-2011) which was not available through university resources. The BLRT in particular requires bootstrap resampling, which is computationally intense and statistically unreliable with small sample sizes ($N = 91$, in this case), so the likelihood-ratio estimates generated would not be stable. AIC and BIC, which were used in the current analysis, are most widely used in LCA literature and are sufficient for interpretation of classes.

Another limitation is with regards to the internal consistency of some psychological measures, that is, the emotionality sub-scale in the Brief HEXACO Inventory, which was substantially lower than conventional psychometric thresholds. The low reliability of this sub-scale means that the class differences must be interpreted with caution. The brief measure was employed to minimise participant fatigue but a longer measure, like HEXACO-60 or HEXACO-100, would yield more stable internal consistency. Future studies should also try to disentangle the specific facets within personality traits that lead to pro-environmental behaviour. This will allow for a more granular analysis and lead to more targeted interventions.

Despite efforts to disguise the survey's purpose during recruitment (Olsen, 2008), the retained sample was strongly skewed toward pro-environmental orientations. Mean scores on the New Ecological Paradigm ($M = 4.04$ on a 1–5 scale), self-transcendence ($M = 5.03$ on a 1–6 scale), and self-determination index were all well above their respective scale midpoints, while external regulation ($M = 1.87$) and amotivation ($M = 1.83$) were low. This narrow gap likely shrank the differences between classes because the less engaged class was not in absolute terms particularly disengaged. Replication in a more demographically and psychologically diverse sample is needed before the present null findings on H3–H6 can be interpreted with confidence.

One gap that still remains is how much of a role income plays in engagement with high-impact climate action, considering that only the top 10% of income earners globally are the ones who need to drastically reduce consumption emissions. Future studies should employ latent regressive models to predict how much weight psychological and demographic factors have independently in predicting engagement in high-impact climate action. Second, there is still a

lack of complete understanding of how much each personality facet contributes to such psychological classes. With more comprehensive HEXACO inventories, these differences will be easy to tease apart, especially if facets are also taken into account. This will provide practitioners with even more granular data on designing targeted messages/interventions. Lastly, it is vital to investigate which of these high-impact climate actions is most susceptible to change. The elasticity of these behaviours has important implications for which individual behaviours should be targeted through interventions in the near future.

Conclusion

This study demonstrated that the pathways leading to pro-environmental behaviour are complex and involve some overlap between psychological and demographic positioning of individuals. By employing LCA, the study was able to uncover three groups of participants, ranging from most environmentally inclined to the least. These groups varied in personality traits, values, pro-environmental attitudes and pro-environmental motivations. The findings were theoretically consistent but more investigation is required to understand how these psychological patterns predict engagement in high-impact climate action, a highly fertile ground for research that has received limited attention in environmental psychology. The practical implications of this research encompass structural changes, at the level of policy and infrastructure, as well as tailored behaviour change interventions that take into account the psychological predispositions of audience segments when framing messages.

AI Disclosure Statement

During the preparation of this thesis, AI language model Claude (Anthropic) was used to assist with the development and troubleshooting of R code used for data cleaning, latent class analysis, and statistical modelling. All analytical decisions, including variable selection, model specification, and interpretation of results, were made by the author. AI-generated code was reviewed, tested, and verified against the data before being used in the final analysis. The author takes full responsibility for the accuracy and integrity of all reported results.

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Appendix A

Ethical clearance form from Lund University.

Department of Psychology, Lund University

DECLARATION OF THESIS' STATUS WITH RESPECT TO RESEARCH ETHICS

The undersigned supervisor and student(s) have read the Law (2003:460) on Ethics of Research Involving Humans (<https://etikprovningensmyndigheten.se/>) and will conduct this thesis in accordance with the principles therein. We will obtain documented consent to participation after research participants have been informed about the research's purpose, methods to be used, possible risks involved, who is responsible, and that participation in the project is voluntary and may be discontinued at any time without any negative consequences. In cases where the purpose of the study cannot be revealed in advance, research participants will receive this information as soon as possible after their participation. For participants who are younger than 15 years, we will obtain their consent as well as that of their guardians.

Select the options that apply to the current thesis.

The thesis study has been approved by the Swedish Ethical Review Authority (Etikprövningsmyndigheten, EPM), with decision number: _____, AND the student(s) has/have familiarized themselves with the content of the ethics application, attachments and additional information (if applicable), as well as the EPM's decision.

Yes ☐ No ☒

(If yes, you do not need to answer any further questions but please, do not forget to sign the form.)

The thesis will:

- | | | |
|--|------------------------------|--|
| 1) Deal with sensitive personal data under the General Data Protection Regulation (2016:679), such as data on ethnicity, political opinions, religious or philosophical beliefs, health, sexuality, or information on illegal acts, that can be tied to a specific person directly or indirectly | Yes ☐ | No ☒ |
| 2) Use a method that involves a physical intervention on research participants | Yes ☐ | No ☒ |
| 3) Use a method that aims to affect the subject physically or mentally | Yes ☐ | No ☒ |
| 4) Pose an obvious risk of mental or physical harm | Yes ☐ | No ☒ |
| 5) Study biological material taken from a living or deceased human being that can be traced back to that person | Yes ☐ | No ☒ |

If any of points 1-5 is answered "Yes", the research purpose and methods must be described in detail and submitted to the course coordinator, along with the final materials to be used (questionnaires, interview guides) as well as information to participants and consent forms. The study may not start until it is approved by the course coordinator.

14/03/2026/Tejasvini Kumar

Date/Student Name

Date/Student Name

Date/Supervisor Name

Signature

Signature

Signature

PSYP01/PSYP02

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Survey

Demographic Questions

- To participate in the survey, please confirm that you live in one of the following countries (Australia, Austria, Belgium, Canada, Costa Rica, Czechia, Chile, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Latvia, Lithuania, New Zealand, Netherlands, Norway, Portugal, Switzerland, Sweden, Taiwan, Uruguay, United Kingdom, United States)
- Informed Consent form (p. 66)
- What year were you born?
- Which one of these best describes your gender? (Man, Woman, Other (please specify))
- What is the highest level of education you have completed? (Primary school, high school, bachelor's, master's, PhD (or other terminal degree e.g., MD, JD), Other (please specify))
- What is your current employment status? (Employed, student, unemployed (unable to work), unemployed (able to work))
- Do you earn \$38,000 (USD) or above a year? (Yes, No)

Table 1

Survey items

Current Climate Actions					
Now, we will ask you about some climate actions that you may engage in. When applicable, how often have you engaged in the following climate actions?					
Items	1 = Never	2 = Rarely	3 = Sometimes	4 = Often	5 = Always
I vote for leaders who make and implement strong climate policies.					
I create media attention on the climate crisis, for example, by writing a letter to the editor.					
I contact political representatives about the climate crisis.					
I take part in peaceful protests for climate action.					

I work with colleagues to meet the climate goals of the Science-Based Targets Initiative for our organization.					
I take climate action throughout my organisation, for example, by involving leadership and staff.					
I take collective climate action or advocate in my professional field, for example, by working with unions or associations.					
I use my particular professional skills for climate action.					
I donate to climate charities.					
I avoid or cut down on flights.					
I avoid or cut down on driving.					
I follow the Planetary Health Diet, primarily a plant-based diet with limited animal products.					
I use renewable electricity at my home.					
I do my best to lead by example in taking the climate actions listed above.					
I share stories about my climate action including successes and challenges to encourage others.					
I work to change the rules, standards and expectations in groups I belong to support climate action.					
I wash my clothes in cold instead of hot water.					
I regularly recycle.					
I hang my clothes to dry instead of using a dryer.					
Past Climate Actions					
Please indicate if you have engaged in any of the following climate actions in the past.					
Items	Yes			No	
I have joined a political party or organisation working for climate action.					
I have divested from funds supporting fossil fuels at my workplace.					
I have divested from personal investment funds supporting fossil fuels.					

I have chosen a fossil-free bank.					
I have built a climate community, people that I talk about and engage in climate action with.					
I have started climate conversations and listened to different perspectives.					
I have changed to a green pension or retirement portfolio.					
I have installed efficient light bulbs in my house.					
I have made the switch from plastic to canvas bags.					
Brief HEXACO Inventory					
Now we will ask some questions about your behaviours and preferences in daily life. Respond with the first answer that comes to mind, there are no right or wrong answers!					
Please indicate to what extent you agree with the following statements, using the following answering categories: 1 = strongly disagree, 2 = disagree, 3 = neutral (neither agree, nor disagree), 4 = agree, and 5 = strongly agree.					
Items	1 = Strongly Disagree	2 = Disagree	3 = Neutral	4 = Agree	5 = Strongly Agree
I can look at a painting for a long time.					
I make sure that things are in the right spot.					
I remain unfriendly to someone who was mean to me.					
Nobody likes talking with me.					
I am afraid of feeling pain.					
I find it difficult to lie.					
I think science is boring.					
I postpone complicated tasks as long as possible.					
I often express criticism.					
I easily approach strangers.					
I worry less than others.					
I would like to know how to make lots of money in a dishonest manner.					
I have a lot of imagination.					

I work very precisely.						
I tend to quickly agree with others.						
I like to talk with others.						
I can easily overcome difficulties on my own.						
I want to be famous.						
I like people with strange ideas.						
I often do things without really thinking.						
Even when I'm treated badly, I remain calm.						
I am seldom cheerful.						
I have to cry during sad or romantic movies.						
I am entitled to special treatment.						
Portrait Value Questionnaire						
Here we briefly describe some people. Please read each description and think about how much each person is or is not like you. Tick the box to the right that shows how much the person in the description is like you.						
Items	Very much like me	Like me	Somewhat like me	A little like me	Not like me	Not like me at all
Thinking up new ideas and being creative is important to them. They like to do things in their own original way.						
It is important to them to be rich. They want to have a lot of money and expensive things.						
They think it is important that every person in the world be treated equally.						
They believe everyone should have equal opportunities in life.						
It's important to them to show their abilities. They want people to admire what they do.						
It is important to them to live in secure surroundings. They avoid anything that might endanger their safety.						
They like surprises and are always looking for new things to do. They think it is important to do lots of different things in life.						

They believe that people should do what they're told. They think people should follow rules at all times, even when no-one is watching.						
It is important to them to listen to people who are different from them. Even when they disagree with others, they still want to understand them.						
It is important to them to be humble and modest. They try not to draw attention to themselves.						
Having a good time is important to them. They like to “spoil” themselves.						
It is important to them to make their own decisions about what they do. They like to be free to plan and not depend on others.						
It's very important to them to help the people around them. They want to care for their well-being.						
Being very successful is important to them. They hope people will recognize their achievements.						
It is important to them that the government insure their safety against all threats. They want the state to be strong so it can defend its citizens.						
They look for adventures and like to take risks. They want to have an exciting life.						
It is important to them always to behave properly. They want to avoid doing anything people would say is wrong.						
It is important to them to get respect from others. They want people to do what they say.						
It is important to them to be loyal to their friends. They want to devote themselves to people close to them.						
They strongly believe that people should care for nature. Looking after the environment is important to them.						

Tradition is important to them. They try to follow the customs handed down by their religion or their family.						
They seek every chance they can to have fun. It is important to them to do things that give them pleasure.						
New Ecological Paradigm – Revised						
Listed below are statements about the relationship between humans and the environment. For each one, please indicate whether you STRONGLY AGREE, MILDLY AGREE, are UNSURE, MILDLY DISAGREE or STRONGLY DISAGREE with it.						
Items	Strongly agree	Agree	Unsure	Disagree	Strongly Disagree	
We are approaching the limit of the number of people the Earth can support.						
Humans have the right to modify the natural environment to suit their needs.						
When humans interfere with nature it often produces disastrous consequences.						
Human ingenuity will insure that we do not make the Earth unliveable.						
Humans are severely abusing the environment.						
The Earth has plenty of natural resources if we just learn how to develop them.						
Plants and animals have as much right as humans to exist.						
The balance of nature is strong enough to cope with the impacts of modern industrial nations.						
Despite our special abilities, humans are still subject to the laws of nature.						
The so-called “ecological crisis” facing humankind has been greatly exaggerated.						
The Earth is like a spaceship with very limited room and resources.						
Humans were meant to rule over the rest of nature.						
The balance of nature is very delicate and easily upset.						
Humans will eventually learn enough about how nature works to be able to control it.						
If things continue on their present course, we will soon experience a major ecological catastrophe.						

Motivation Towards the Environment					
A few minutes ago you reported on engaging in some climate actions. Keeping those in mind, answer the following questions.					
Why are you doing things for the environment?					
Items	1 = Strongly Agree	2 = Agree	3 = Neutral	4 = Disagree	5 = Strongly Disagree
For the pleasure I get in mastering new ways to help.					
For the pleasure I get in improving the quality of the environment.					
Because I like the feeling I get when doing things for the environment.					
For the pleasure of contributing to the environment.					
Because taking care of the environment is an integral part of my life.					
Because it seems to me that taking care of myself and taking care of the environment are inseparable.					
Because it is part of the way I have chosen to live my life.					
Because my environmental awareness has become a fundamental part of who I am.					
Because it is a sensible thing to do something about the environment.					
Because it is the way I have chosen to contribute to the environment.					
Because it is a reasonable thing to do something about the environment.					
Because I think it is a good idea to do something about the environment.					
Because I think I'd regret not doing something about the environment.					
Because I'd feel guilty if I didn't do anything about the environment.					
Because I'd feel bad if I didn't do anything about the environment.					
I'd be ashamed not to do anything about the environment.					
Because other people would be mad if I didn't do anything about the environment					
For the recognition I get for it from others.					
Because my friends insist that I do.					
To avoid being criticised.					
I wonder why I'm doing anything about the environment, since the situation isn't improving.					

I feel that doing something about the environment is a waste of time.					
I can't see how my efforts to be environmentally friendly are helping the environment.					
I can't see what's in it for me.					

Informed Consent

Informed consent to participate in a study at the Department of Psychology, Lund University.

Description: You are invited to participate in a research study on how personal characteristics of individuals relate to behaviours towards the natural world. You will be asked questions about your ways of thinking, habits and behavioural tendencies.

Risks and benefits: The risks associated with this study are anticipated to be minimal. The benefits which may reasonably be expected to result from this study are an increased understanding of your own styles of thinking and behaving, resulting from reflections through the survey. However, we cannot and do not guarantee or promise that you will receive any benefits from this study.

Time involvement: Your participation in the survey will take approximately 15-20 minutes.

Payments: Participation is completely voluntary, and you will not receive any monetary compensation for your participation.

Subject rights: If you have read this form and have decided to participate in this project, please understand your participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time without penalty. You have the right to refuse to answer particular questions. Your individual privacy will be maintained in all published and written data resulting from the study.

If you agree to participate in this research, please mark the 'yes' checkbox below.

Appendix B

Table B1

Sample demographic characteristics (N = 91)

Variable	Category	n	%
Age (years)	M = 37.0, SD = 13.3, Range = 22-76	84	92.3
Gender	Man	28	30.8
	Other	3	3.3
	Woman	56	61.5
	Missing	4	4.4
Education	Bachelor's	29	31.9
	Master's	29	31.9
	PhD (or other terminal degree, e.g., MD, JD)	20	22.0
	Missing	13	14.3
Employment	Employed	57	62.6
	Student	27	29.7
	Unemployed (able to work)	6	6.6
	Unemployed (unable to work)	1	1.1
Country of residence	Australia	1	1.1
	Austria	1	1.1
	Canada	4	4.4
	Czechia	1	1.1
	Denmark	3	3.3
	France	1	1.1
	Germany	26	28.6
	Ireland	1	1.1
	Japan	1	1.1
	Netherlands	3	3.3
	Sweden	26	28.6
	Switzerland	2	2.2
	United Kingdom	9	9.9
	United States	12	13.2
Income >= \$38,000 USD	No	43	47.3
	Yes	47	51.6

Variable	Category	n	%
	N/A	1	1.1

Table B2

Endorsement frequencies for past climate actions

Climate Action	n (Yes)	n total	%
Switched plastic to canvas bags	86	91	94.5
Installed efficient light bulbs	75	91	82.4
Started climate conversations	67	91	73.6
Divested personal investment fossil-fuel funds	34	91	37.4
Built a climate community	32	91	35.2
Joined political party for climate action	24	91	26.4
Changed to green pension/retirement	12	91	13.2
Divested workplace fossil-fuel funds	11	91	12.1
Chose a fossil-free bank	5	91	5.5

Table B3

Mean engagement in individual climate actions, grouped by SHIFT Role

Climate Action	Scale	M (SD)
1. Recycle regularly (Consumer)	Frequency (1-5)	4.26 (0.95)
2. Hang clothes to dry instead of using a dryer (Consumer)	Frequency (1-5)	3.75 (1.23)
3. Avoid or cut down on driving (Consumer)	Frequency (1-5)	3.59 (1.13)
4. Wash clothes in cold instead of hot water (Consumer)	Frequency (1-5)	3.49 (1.29)
5. Avoid or cut down on flights (Consumer)	Frequency (1-5)	3.19 (1.22)
6. Follow the Planetary Health Diet (plant-based) (Consumer)	Frequency (1-5)	3.15 (1.33)
7. Use renewable electricity at home (Consumer)	Frequency (1-5)	3.11 (1.40)
8. Switched from plastic to canvas bags (Consumer)	Yes/No (0-1)	0.96 (0.21)
9. Installed efficient light bulbs (Consumer)	Yes/No (0-1)	0.90 (0.30)
10. Donate to climate charities (Investor)	Frequency (1-5)	2.35 (1.21)
11. Divested personal investment funds from fossil fuels (Investor)	Yes/No (0-1)	0.45 (0.50)
12. Divested workplace funds from fossil fuels (Investor)	Yes/No (0-1)	0.17 (0.38)

Climate Action	Scale	M (SD)
13. Changed to a green pension or retirement portfolio (Investor)	Yes/No (0-1)	0.16 (0.37)
14. Chose a fossil-free bank (Investor)	Yes/No (0-1)	0.09 (0.29)
Vote for leaders who implement strong climate policies (Citizen)	Frequency (1-5)	4.09 (1.13)
1. Take part in peaceful protests for climate action (Citizen)	Frequency (1-5)	2.00 (1.04)
2. Create media attention on the climate crisis (Citizen)	Frequency (1-5)	1.82 (1.16)
3. Contact political representatives about the climate crisis (Citizen)	Frequency (1-5)	1.56 (0.88)
4. Joined a political party or organisation working for climate action (Citizen)	Yes/No (0-1)	0.28 (0.45)
5. Lead by example in taking climate actions (Role Model)	Frequency (1-5)	3.33 (1.14)
6. Work to change rules and norms in groups (Role Model)	Frequency (1-5)	2.54 (1.24)
7. Share stories about climate action with others (Role Model)	Frequency (1-5)	2.26 (1.27)
8. Started climate conversations and listened to other perspectives (Role Model)	Yes/No (0-1)	0.79 (0.41)
9. Built a climate community (Role Model)	Yes/No (0-1)	0.37 (0.49)
10. Use professional skills for climate action (Professional)	Frequency (1-5)	2.74 (1.60)
11. Take climate action throughout the organisation (Professional)	Frequency (1-5)	2.31 (1.35)
12. Work with colleagues to meet organisational SBTi goals (Professional)	Frequency (1-5)	2.11 (1.26)
13. Take collective action in professional field (Professional)	Frequency (1-5)	1.92 (1.12)

Note. N = 91. Items are grouped by the SHIFT role they tap (shown in parentheses). Current actions were rated on a 5-point frequency scale (1 = Never, 5 = Always). Past actions were coded as Yes (1) / No (0); for these items, M can be interpreted as the proportion of respondents who endorsed the action. Items within each role are sorted by descending mean.

Table B4

Standardized mean scores on indicators by latent class (K = 3)

Indicator	Self-Focused (n = 39, 42.9%)	Humble Conventionalist (n = 31, 34.1%)	Engaged Eco-Conscious (n = 21, 23.1%)
Honesty-Humility	-0.50	0.41	0.32

Indicator	Self-Focused (n = 39, 42.9%)	Humble Conventionalist (n = 31, 34.1%)	Engaged Eco- Conscious (n = 21, 23.1%)
Emotionality	0.19	-0.05	-0.28
Extraversion	-0.44	0.00	0.81
Agreeableness	-0.25	0.33	-0.02
Conscientiousness	-0.17	0.01	0.30
Openness	-0.20	-0.55	1.18
Self-Transcendence	-0.04	-0.23	0.42
Self-Enhancement	0.60	-0.64	-0.17
Conservation	0.23	-0.10	-0.28
Openness to Change	0.26	-0.68	0.51
NEP (Ecological Worldview)	-0.23	0.08	0.30
Self-Determination Index	-0.22	-0.14	0.61

Note. N = 91. Cell values are class-specific means on z-scored indicators (M = 0 and SD = 1 across the full sample). Positive values indicate that class scored above the sample average on that indicator; negative values indicate that class scored below the sample average. $|z| \geq 0.50$ reflects a meaningful deviation from the sample mean; $|z| \geq 1.00$ reflects a substantial deviation.