

Article

Identification of Six Emergent Types Based on Cognitive and Affective Constructs that Explain Individuals' Relationship with the Biosphere

Andrea Marais-Potgieter *  and Andrew Thatcher 

Department of Psychology, University of Witwatersrand, Johannesburg 2050, South Africa;
Andrew.Thatcher@wits.ac.za

* Correspondence: andrea@plunge.co.za

Received: 11 June 2020; Accepted: 24 August 2020; Published: 16 September 2020



Abstract: To address the pathological human–nature nexus, psychological processes that impact this relationship need to be further understood. Individual differences related to personality, values, worldviews, affect, and beliefs are likely to influence how people relate to the natural world. However, there is a lack of empirically-based ecopsychological research exploring multiple individual attributes. Understanding individual differences enables the strategic design of planetary-focused interventions, such as advocacy, policy, and technology development. Using a theoretical model that incorporates intrinsic, affective, cognitive, and behavioral constructs, this study sought to identify and describe different types of people and their relationship with the biosphere. Seven hundred and fifty-three people completed an online quantitative questionnaire battery. Results from the cluster analyses of the cognitive and affective constructs showed that six heterogeneous types existed. Their different descriptive expressions of intrinsic, affective, cognitive, and behavioral constructs provide a deeper understanding of each type's relationship with the biosphere.

Keywords: typologies; environmental concerns; values; interventions; ecopsychology

1. Introduction

The world is entering its 6th mass extinction, and this one is anthropogenic [1]. Ecopsychology [2] isolates this as evidence that the relationship that people have with the biosphere is pathogenic. Individual attitudes and actions, such as having one fewer child, living car-free, avoiding airplane travel, and eating a plant-based diet, are highly effective strategies to reduce an individual's impact on the biosphere [3]. However, research focusing on understanding the relationship that individuals have with the biosphere needs further exploration to understand why everyone is not adopting these high-impact actions, and how nuanced strategies might target them.

2. The Relationship between Individuals and the Biosphere

Exploration of the underlying components (such as affect) of the human–nature nexus is needed [4], since it influences environmental beliefs, values, and attitudes [5]. This study defines a “relationship with the biosphere” as a complex interaction between the psychological constructs of individual factors, affect, cognition, and the behavioral experience of nature that is more inclusive compared to a linear understanding of climate change, environmental attitudes, and behavior.

Nature affinity/commitment, biophilia, ecological self/identity, or environmental sensitivity describe close relationships with nature [6] and are often a consequence of early childhood nature experiences [7]. Understanding how people define their relationship with the biosphere explains their affect [8]. There is an inherent complexity in the human–nature nexus, as some people see themselves

as part of nature, yet consider the definition of nature to be undisturbed and free from humans [8]. There is a need for a broader understanding of the deeper psychological processes that impact the complex relationships that people have with the biosphere.

Typologies as Ways to Understand Complex Relationships

Typologies are organized systems of types that explore relationships and allow for theory building [9]. The role of typologies is to reduce complexity in the empirical realm by constructing a minimum number of types with a maximum amount of homogeneity [9]. Furthermore, the role of typologies is to acknowledge the multidimensionality of human nature by considering interactions between multiple human attributes [10]. Typologies stretch beyond traditional linear models of causality; they allow for the exploration of multiple relationships between variables; they can account for levels of causal complexity, and can function as a shorthand device for cognitive simplification of a complex relationship [9]. Typologies identify, organize, and describe patterns of emergence without sacrificing the wholeness of individuals (i.e., “pigeon-holing”) that make up the typology [11].

There is no standardization of what components must be assessed to develop a typology, but some guidelines exist: each variable should have equal opportunity to be a clustering or a profiling variable [12], rigor needs to be used in concept formation, and there needs to be a hierarchical structure of concepts with an overarching concept that contains explicit dimensions [13]. Typologies should include salient elements related to the phenomenon under investigation, each feature needs to be shared by many participants, and each participant needs to possess many features [14]. Typologies need to be interpretable [14], explain complex social realities [15], and be homogeneous [12], with maximum deviation between types [14].

Previous typologies identified, explored, and understood the human–nature nexus from a range of perspectives. The typological landscape typically ranges from global warming [16], climate change [17], sustainability [18,19], positionality [20,21], biodiversity [22], behavior [23,24], animals [25,26], eco-tourism [27], policy [28], green marketing [29], risk and culture [30], and environmental moral reasoning and values [31]. Although these typologies provide insight into the human–nature nexus, some gaps exist. These typologies mostly used limited variables, often excluding explanatory psychological processes, such as personality, values, and affect. Most typologies also tended to be constructed in the USA, with some work extending into Asia and Europe, but not Africa. Finally, the typologies often followed linear conclusions that failed to acknowledge the interconnected processes that underlie the human–nature nexus.

There exists an opportunity to expand the understanding of the human–nature nexus by using multiple psychological variables to identify the underlying psychological processes that influence the relationship. There is a need to move beyond only behavioral aspects, but also to explore those related to intrinsic, cognitive, and affective components.

The main aim of the study was to identify and describe types through emerging properties of complex, multi-factorial relationships with the biosphere using multiple psychological constructs (i.e., intrinsic, cognitive, affective, and behavioral constructs). In this paper we report a more complete understanding of the human–nature nexus to allow for nuanced interventions, targeted psychological disaster preparedness, and strategic policy development.

3. Methods

3.1. Participants and Procedure

Ethical clearance (number H15/11/15) was granted unconditionally by the university’s Human Research Ethics Committee (non-medical). A statistician evaluated the questionnaire battery before it was pilot-tested with eight participants. The self-developed questionnaires were adjusted: simplification of attributes, explanation of concepts (i.e., fair trade), and repetitive attributes were

either clarified or removed. Online survey tools were used to collect the data (Vision Critical and the Jung Type Indicator online).

Participants were recruited primarily using social media. Therefore, the sample was purposively shaped to include mainly urban, literate individuals with Internet access, and was likely to consist primarily of individuals with the highest carbon footprints [32]. When the participants opted in, they were screened to identify as South African, with English competence, at least 18 years old, and with desktop computer access. They were then directed to the online questionnaire battery. A lucky draw in a separate survey option was offered as compensation for their time.

The total sample included 753 participants, consisting of 39.6% men and 60.4% women. Sample ethnicity was 40.9% White, 38.2% Black, 11.2% Mixed, and 6% Indian; 2.3% refused, and 1.5% stated “other” compared to South African middle-class statistics of 51% Black, 9% Mixed, 6% Indian, and 34% White [33]. The majority of the sample was based in Gauteng (51.8%) with 21.5% in the Western Cape, 14.2% in KwaZulu-Natal, 6.1% in the Eastern Cape, and 6.4% in one of the other provinces in South Africa. The age spread consisted of 27% 18–25 years, 29.9% 26–35 years, 19.9% 36–45 years, 18.9% 46–55 years, 3.5% 56–65 years, and 0.9% 66+ years.

3.2. Measures

To select and design the measures, a literature review was conducted to identify aspects that provide insight into the human–nature nexus. Based on this literature review, the variables (i.e., personality versus behavior, etc.) were grouped into four explanatory constructs. The explanatory constructs were: intrinsic [34–37], cognitive [38–43], affective [44–46], and behavioral [47–50]. These explanatory constructs and dimensions were chosen for inclusion into the study test battery to explore whether they are collectively able to provide a fuller picture of the human–nature nexus, especially related to typology building. Each variable in each construct was chosen based on its ability to provide a nuanced understanding of the human–nature nexus rather than being guided by an underlying *a priori* theory. The purpose of this study was to provide a framework for new theory rather than to test an existing theory. The variables were therefore purposely drawn from multiple theoretical frameworks.

3.2.1. Intrinsic Construct

The intrinsic construct is defined as individual aspects that are stable and, to some extent, unconscious traits, such as personality and values [51], and able to explain the human–nature nexus [52]. The variables used in the intrinsic construct were: demographics, personality, and values [53].

Personality assists the understanding of environmental views [54] since it describes how a person relates to and interprets the world [55]. Jung’s work often focused on the repression of nature, animals, creative fantasy, and the primitive side of humans, and therefore his personality theory took this into consideration [36]. The Jung Type Indicator (JTI) measured personality by asking the degree of agreement on a scale of 1–5 on 60 items to identify psychological types based on attitudes (extraversion versus introversion—EI), psychological functions (sensing versus intuiting—SN; thinking versus feeling—TF), and secondary processes (judging versus perceiving—JP) [56]. The JTI had a high level of internal reliability across samples, ranging from 0.83 to 0.88 (EI), 0.78 to 0.86 (SN), 0.75 to 0.84 (TF), and 0.75 to 0.85 (JP) [56]. The JTI was chosen because it uses modern psychometric test theory (identifying preferences across four dimensions rather than a dichotomous model); it interprets psychological types as being on a continuum rather than as discrete categories. A limitation of using the JTI was that due to the proprietary nature of the measure, individual items were not available for Cronbach alphas to be calculated and therefore reliability and internal consistency could not be established.

The Schwartz value theory describes values as linked to affect, motivating action, as transcending situations, serving as standards or criteria, and hierarchical; according to the theory, values of importance guide action [37]. Individuals are more likely to protect things that they value [37,57]. The Schwartz Value Survey (SVS) was chosen for this study because it is the most widely used values

survey, measures ten universal values, and is adequate for research across cultures [37]. The SVS uses 57 items to measure ten culturally universal values, namely power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity, and security, using a rating of between −1 (opposed to value) to 7 (value of supreme importance). Across 212 samples, alpha reliabilities of the ten values averaged 0.68, ranging from 0.61 for tradition to 0.75 for universalism [37]. The Cronbach alpha was calculated using raw scores as was done in a South African study [58] and showed 0.72 for conformity, 0.68 for tradition, 0.70 for benevolence, 0.75 for universalism, 0.60 for self-direction, 0.60 for stimulation, 0.64 for hedonism, 0.73 for achievement, 0.67 for power, and 0.60 for security. A limitation of using the SVS is the lack of research using this instrument in the South African context; therefore comparative data are sparse.

3.2.2. Cognitive Construct

In the context of this study, the cognitive construct is defined as the mental process of knowing, awareness, perception, reasoning, and judging [59–63] rather than affect [64]. The cognitive construct was captured by the various aspects of environmental awareness [60,65].

Environmental awareness, attitudes, and concern are the extent to which individuals are cognitively aware and concerned about environmental issues [62,66]. To understand issues that individuals prioritize versus marginalize [67], a measure of awareness, concern, and attitudes towards the environment (the Environmental Issues and Attitudes Questionnaire—EIAQ) was developed to include concerns specific to South Africa (i.e., canned lion hunting; poaching). No single existing questionnaire could be found that included issues such as natural disasters, water scarcity, human overpopulation, poaching, use of pesticides, animals used in entertainment, over-fishing, animal cruelty, factory farming, and vivisection. This questionnaire contained four sections, namely ranking, environmental (awareness, concerns, and accountability), animal (awareness, concerns, and accountability), and general attitudes.

The first section explored the level of awareness to personal safety, economic, social, religious, environmental, health, political, animal rights, and international tension issues on a 4-point scale, where 0 = I do not know, 1 = I am now less aware than before, 2 = My awareness is the same as before, and 3 = I am more aware than before. The second section then explored the degree of concern about specific environmental versus animal issues on a 6-point scale, where 0 = No opinion, 1 = Not at all concerned, 2 = Slightly concerned, 3 = Somewhat concerned, 4 = Moderately concerned, and 5 = Extremely concerned. The third section contained an accountability question asking the participants the extent to which they felt they had control (locus of control) over the items they were concerned about on a 4-point scale, where 0 = I do not know, 1 = I have no control over this, 2 = I can maybe change something small or help in a small way, and 3 = What I do could have a direct impact. The final section in the questionnaire explored attitudes towards the environment, domestic animals, farm animals, wild animals, and general topics on 6-point scale, where 0 = Do not know, 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, and 5 = Strongly agree.

Varimax (orthogonal) rotation factor analysis was conducted on the EIAQ to determine underlying dimensions in the data and to reduce the dimensionality of the data for further analysis. The factor analysis reduced the items from 67 to 60, where items with loadings <0.50 were removed. The environmental concern subscale yielded four factors: human-centric (items included human overpopulation, loss of natural rea, waste generation, urbanization, over consumption, and biodiversity loss) ($\alpha = 0.795$), climate-centric (items included climate change, rising sea level, global warming, natural disaster, and ozone depletion) ($\alpha = 0.824$), resource-centric (items included air pollution, water scarcity, and natural resource depletion) ($\alpha = 0.752$), and science-centric (items included nuclear energy, pesticides, and genetically modified organisms GMO) ($\alpha = 0.668$). The animal concern subscale yielded two factors: animal exploitation (items included animals used in entertainment, animals' legal rights, domestic breeding, wild breeding, factory farming, domestic/farm animal welfare, vivisection, and animals used in consumer products) ($\alpha = 0.894$) and animal extinction (items included canned lion hunting, deforestation, overfishing, whale hunting,

dolphin capture, cruelty, poaching, and trophy hunting) ($\alpha = 0.886$). The attitudes subscale had five factors: shifting responsibility (items included environmental/domestic animals/farm animals/wild animals issues are overstated/exaggerated, environmental/domestic animals/farm animals/wild animals issues are for future generations to deal with, and wild animals should contribute to the economy) ($\alpha = 0.904$), role of the individual (items included each individual can contribute to better environmental/domestic/farm/wild animal welfare) ($\alpha = 0.707$), role of government (items included environmental/domestic/farm/wild animal issues are the government's responsibility) ($\alpha = 0.809$), role of technology (items included environment/domestic/farm/wild animal issues will be solved through technological progress) ($\alpha = 0.826$), and apathetic attitudes (items included hard to change, environment is not a priority, effects of environmental destruction is too far in the future, too much effort to adopt an environmentally friendly lifestyle) ($\alpha = 0.747$). A limitation of the EIAQ is that many of the items are specific to South Africa, such as canned lion hunting, and therefore the instrument might not be a reliable measure for use in countries where environmental issues of this nature are unknown.

3.2.3. Affective Construct

Understanding affect towards nature allows for a movement away from single superficial issues (like changing light bulbs) towards a deeper understanding of the underlying emotional processes that impact ecological behavior [64]. Affect influences beliefs, values, behavior, attitudes, and moral disengagement [68]. The affective construct sought to understand how the individual feels about nature [64] and draws on the theoretical guidelines of the field of ecopsychology [45].

The Connectedness to Nature Scale (CNS) [64] measures an individual's affective connection to nature using 14 items. Connectedness to nature includes feelings such as a sense of community, kinship, egalitarianism, and belongingness to nature. The CNS was chosen as it is linked to Leopold's (1948) [69] and ecopsychology's [45] interpretation of affective connectedness to nature. Participants responded on a 5-point scale, where 1 = strongly disagree and 5 = strongly agree. An overall Cronbach's $\alpha = 0.84$ and test-retest reliability of $r = 0.79$ were reported [64]. In this study the Cronbach $\alpha = 0.83$. It is unknown whether the CNS is stable for use across cultures. Although it was a limitation, the Cronbach for this study was sufficient.

3.2.4. Behavioral Construct

Behavior is not an adequate form of typology on its own [70], but is impacted by locus of control, personality, accountability [71], and values [72]. Including a behavioral construct would provide a broader understanding of each type.

The Behavioral Questionnaire (BQ) was self-developed to evaluate current behaviors, such as waste, transport, energy, purchase and consumption, water, and general behaviors. No existing behavioral questionnaire included broad-ranging aspects related to waste, transport, energy, purchase, consumption, water, and charitable behaviors. Questionnaires and attributes used by the Department for Environment, Food and Rural Affairs [23] and the Organization for Economic Co-operation and Development [49] were used as a framework. The BQ asked participants to what extent they participated in a range of behaviors on a scale of 1 = never do it, 2 = rarely do it, 3 = sometimes do it, 4 = often do it, and 5 = always do it. Sample items were as follows: the waste section included "recycle glass bottles/containers"; the transport section included "find ways to reduce fuel consumption"; the energy section included "switch off lights when not needed"; the purchase and consumption section included "purchase products that generate the least amount of waste"; the water section included "bath less, shower more"; and the general section included "I grow my own vegetables and fruits".

Varimax (orthogonal) rotation factor analysis was conducted on the BQ to determine underlying dimensions in the data and hence to reduce the dimensionality of the data for further analysis. The factor analysis reduced the questionnaire items from 58 to 41, where items with loadings <0.50 or those loading on multiple factors were removed. The BQ had nine factors: recycle (items included recycle glass, plastic, cans, paper, batteries, medication, and reuse cans) ($\alpha = 0.885$), energy reduction

(items included switch off lights, energy saving lightbulbs, use appliances less, and turn off appliances off) ($\alpha = 0.776$), conscious consumption (items included purchase products with least waste, purchase organic/fair trade/non-endangered fish/free range, carbon count purchases, boycott bad companies, and purchase local/environmentally friendly) ($\alpha = 0.853$), environmentally friendly travel (items included public transport, recycled tires, and walk or cycle) ($\alpha = 0.681$), charitable behavior (items included give money to wildlife/animal welfare groups and volunteer time to wildlife/animal welfare groups) ($\alpha = 0.866$), environmentally conscious travel (items included reduce air travel, reduce fuel use, and adapt driving style) ($\alpha = 0.723$), individual water reduction (items included bath less, shorter showers, and turn off water when brushing teeth) ($\alpha = 0.613$), re-use (items included glass, plastic, and paper re-use) ($\alpha = 0.759$), and smart gardening (items included capture rain water, use grey water, and grow own fruit and vegetables) ($\alpha = 0.666$). The BQ fails to cover all behavioral items imaginable and therefore might not be a complete measure for use across studies.

The benefits of self-report measures include: they are practical and effective, convenient and easy to administer, affordable, provide direct insight into unique information, give individual inspiration to respond, provide control of most response biases, and provide some readily available psychometrically-tested inventories [73]. Self-report measures are ideal for exploring issues related to the environment since participants feel less burdened [74]. Some drawbacks include that they are open to social desirability, agreeable, or extreme responding. There is the assumption that participants are self-knowledgeable and do not have distorted self-perceptions, issues with non-context-specific use of language, and cultural limitations in studies with moral overtones [73]. Limitations such as self-selection, demand characteristics, and response burden were minimized by allowing participants to remain anonymous, confirming that there were no right or wrong answers, and excluding repetitive responses in the data. Participants were able to complete the questionnaire in various sittings to reduce fatigue and were screened for English proficiency.

3.2.5. Demographic Descriptive Variables

Demographics can be a good predictor [47] or a poor predictor [53] of environmental issues. Demographics were therefore only included for descriptive purposes. The Demographics Questionnaire (DQ) asked for geographical location, age, gender, population group, religion, English competency, and educational level.

3.2.6. Confirmatory Descriptive Variables

While worldviews might also be considered as an aspect of the cognitive construct, the measure selected for this study correlated significantly with the measure for the affect construct and therefore was treated only as a confirmatory descriptive variable in this study. Worldviews represent an individual's inner experience of the outer world [60] and inform how reality is interpreted [61]. The New Ecological Paradigm Scale (NEP) was selected based on its extensive use for establishing environmental worldviews [62], and its use in emerging economies [63]. The NEP does not measure emotional or physical connections to the natural world [64]. It uses 15 items, including an ecological paradigm (8 items) and a dominant social paradigm (7 items) [38]. Participants responded on a 5-point scale, where 1 = strongly disagree and 5 = strongly agree [38]. In this study, the overall scale's Cronbach alpha was 0.772, similar to more developed countries [65]. The NEP facets (reality of limits to growth, anti-anthropocentrism, the fragility of nature's balance, rejection of exemptionalism, and the possibility of an eco-crisis) would have added more descriptive depth, but due to the low Cronbach alphas on these facets, the NEP was used as a single measure in this study.

The factor analysis of the EIAQ produced 11 distinct variables. As is described in the analysis section, this was too many clustering variables to consider for cluster analysis given the sample size. Based on the correlation between the EIAQ variables, six variables were selected for clustering and five variables were selected for confirmatory descriptive analysis. These variables were climate-centric,

animal exploitation, animal extinction, the role of government, and the role of technology from the EIAQ.

3.3. Analysis

Data analyses were carried out using STATISTICA version 12 [75]. The first step in the analysis was a cluster analysis to determine the different types in the data. The clustering variables came from the cognitive and affective constructs. Variables selected for cluster analysis needed to represent these two constructs with a minimum theoretical sample size for cluster analysis being $n = 5 \times 2k$, where k is the number of clustering variables. Given the sample size of 753, approximately seven clustering variables could be afforded. Because of the large number of possible clustering variables for the cluster analysis ($n = 13$ variables), the variables were selected based on their correlation with each other, as determined by Spearman's rank correlation. For those moderately or highly correlated, one variable was considered for the cluster analysis and the other for a confirmatory descriptive analysis. The assignment of the clustering variables was explored in numerous iterations and halted when the cluster solution showed stability, clarity, and uniqueness. Clustering variables had to be cumulatively coherent to depict "nuanced" clusters. On this basis, the clustering variables selected were connectedness to nature (CNS), shifting responsibility, role of individual, apathetic attitudes, human-centric, resource-centric, and science-centric from the EIAQ. The intrinsic and behavioral constructs were considered as profiling variables: values (SVS), personality (JTI), and behavior (BQ). The remaining variables (i.e., environmental worldviews (NEP), climate-centric, animal exploitation, animal extinction, role of government, and role of technology from the EIAQ) were considered as confirmatory descriptive variables either because of their high correlation with the clustering variables and the demographic variables or because they were not strictly psychological variables.

K-means cluster analysis employed the selected clustering variables using the options for four, five, or six clusters. Cluster stability was determined by cross-tabulating the results for the same cluster using different starting points. Observations selected were based on their ability to maximize initial between-cluster distances, and observations were taken at constant intervals from a list of sorted distances. Cluster solutions where less than 5% of cases were misclassified were reserved for consideration. After the clusters were identified using the clustering variables present in the data, the remaining variables were used to profile the clusters. The variables were all on similarly constructed scales and standardization was not required.

The second step in the analysis was to use the profiling variables to determine whether there were any significant differences across the clusters. The association between clusters and the profiling variables was determined using multiple independent one-way analysis of variance (ANOVA). Post-hoc tests were conducted using the Tukey–Kramer test, a conservative post-hoc test for unequal group sizes where the p -value of the pairwise comparisons are adjusted for multiple comparisons. The false discovery rate was controlled by the Benjamini–Hochberg procedure. For the confirmatory descriptive variables, analyses were conducted using multiple independent ANOVAs, or the X^2 test was used to assess the relationships between clusters and categorical demographic variables. Fisher's exact test was used where the requirements for the X^2 test could not be met.

4. Results

4.1. Six Types Identified

Out of the total sample of 753 participants, 721 were used for the cluster analysis (due to missing data) based on the qualifying clustering variables. Six types emerged: Disconnected (DIS; $N = 75$), Uncommitted (UNC; $N = 120$), Alarmed (ALM; $N = 176$), Believer (BEL; $N = 104$), Concerned (CON; $N = 170$), and Pleasure-seeker (PSS; $N = 76$). Types were named based on their distinguishing characteristics that emerged from the analyses. Euclidean distances were calculated as the squared root of the average of the square difference between the attributes of the observations. The Uncommitted

and the Believer types had the shortest distance between each other (0.413), and the Uncommitted and the Concerned (0.456) and the Uncommitted and the Alarmed (0.503) also had a relatively short distance between each other. The Concerned and the Pleasure-seeker were the furthest apart (2.511), while the Disconnected and the Concerned (1.720), the Uncommitted and the Pleasure-seeker (1.470), and the Believer and the Pleasure-seeker (1.770) were also respectively far apart. These distances, combined with significant ANOVAs and meaningful profiling, suggested well-differentiated types. Six types were confirmed using pseudo-F [76], where a pseudo-F of 178.1 was shown for six versus 173.8 for four, 177.0 for five, and 168.4 for seven clusters.

4.2. Type Orientation

For this paper, we only focused on the distinctive qualities of each type due to the vast number of statistically significant results available. This section aims to provide the reader with an orientation regarding the emerging qualities that makes each type unique in order to enable a contextual orientation for type comparisons to follow.

4.2.1. The Disconnected

The Disconnected type had the lowest connectedness to nature; they lacked an environmental worldview and showed little concern for matters related to animal extinction and exploitation. They were unlikely to take responsibility for issues related to nature, as expressed in their apathy and low pro-environmental behavior. They valued achievement and power showing a tendency towards dominance. Their low scores on benevolence and universalism suggested that they were affectively disconnected from the outside world. They were more extraverted than introverted and scored low on feeling, orientating themselves towards the external rather than the inner world.

4.2.2. The Uncommitted

The Uncommitted type showed a lack of overall commitment as they scored moderately on many aspects, such as affect, environmental worldviews, animal exploitation, and extinction. They believed that environmental issues were pressing, but lacked a sense of personal accountability. They behaved somewhat pro-environmentally in areas that had public and social value, such as recycling, energy, and water reduction. They were followers that sought social approval. They did not value self-direction, stimulation, or hedonism. The combination of values suggests that they did not like independent thought, challenges in life, or self-indulgence and preferred to focus on areas that gained social approval. They regulated their emotions as indicated by their scores on the feeling and introversion personality dimensions.

4.2.3. The Alarmed

The Alarmed type had a moderate-high affective connection to nature and low-moderate apathy. Their environmental worldviews were moderate, although they perceived urgency in both environmental and animal issues. Their environmental behavior did not match their environmental concerns, with scores similar to the Uncommitted, suggesting a poor locus of control. They did not score high on any specific value but showed a disinterest in conformity, tradition, benevolence, and security. Thus, they were likely to refuse to inhibit themselves according to the rules of society, challenged customs that represented shared experiences, and lacked a need for affiliation with others. They scored high on introversion and therefore focused more on their inner world rather than having contact with people and events. This disconnect between inner and outer worlds might explain why their inner world was connected emotionally to nature, but in the outer world their behavior did not match what they felt in their inner world.

4.2.4. The Believer

For the Believer type, their affective connection to nature contrasted with their dominant social paradigm. This incongruence might be due to their highly religious views (scored the highest on religiosity = 87%) and human-centric concerns. They believed that human ingenuity through technology would solve environmental and animal issues but tended to shift responsibility for these problems to future generations. They were highly focused on energy reduction, environmentally friendly travel, and re-using. These pro-environmental behaviors might be related to the associated financial benefits. They were somewhat conservative in their approach to life, and they used social standards as a measure for their own progress. Their traditional values led to acceptance of customs and ideas in culture or in religion, which supported the religiosity of this type. They had a judging personality, which meant that they tended to evaluate information that they received and also regulated their mental events.

4.2.5. The Concerned

The Concerned type scored the highest on connectedness to nature and had the strongest environmental worldviews. They were the most concerned about individuals taking responsibility, with a focus on human-centric, resource-centric, and science-centric issues. They were also the most concerned about animal exploitation and extinction and scored the lowest on apathetic attitudes. They claimed to behave the most pro-environmentally out of all the types, except on energy reduction and environmentally friendly travel, where they scored lower than the Believer type. The Concerned were worried because they were open to the world. They scored high on benevolence, which meant that they were genuinely concerned about the welfare of others. They also scored high on universalism, which meant they easily took different perspectives. They showed independence, curiosity and valued self-direction. They did not value conformity, tradition, hedonism, achievement, or power. They scored high on feeling and intuition.

4.2.6. The Pleasure-seeker

The Pleasure-seeker type showed a weak affective relationship with the biosphere and a low environmental worldview which, suggested that they do not think, notice, or care about the biosphere. They were not concerned about environmental issues and felt that individuals were not responsible for them. They scored second highest on apathetic attitudes and lowest on concern about human-centric, resource-centric, science-centric, and climate-centric issues. They scored the lowest on concern about animal exploitation, extinction, and on all behavioral measures. They valued self-enhancement as expressed in the highest score on hedonism and stimulation, which meant they were driven by a life that was exciting, novel, and sought instant gratification. They scored the lowest on benevolence and universalism, which showed that they had little care for others or nature while valuing personal success, social status, prestige and dominance over people and resources. Their personality profile suggested that they were indifferent to the outside world, since they failed to attach emotional value to objects, people, or events and might be emotionally blunt.

4.3. Comparing Clustering Variables

The variables used for clustering were the CNS, EIAQ shifting responsibility, role of the individual, apathy, human-centric, resource-centric, and science-centric. Table 1 shows the statistical analysis differences across the clustering variables and Figure 1 is a line graph aimed at showing visually how the types trended across these clustering variables.

Table 1. Performance on clustering variables.

Clustering Variables	DIS N = 75	UNC N = 120	ALM N = 176	BEL N = 104	CON N = 170	PSS N = 170	Df/F-stat	η^2	Significant Differences between Types
Connectedness to nature	3.80 (0.68)	4.43 (0.66)	5.04 (0.59)	5.25 (0.50)	5.93 (0.52)	4.16 (0.77)	F(5721) = 190.5 *	0.57	CON > ALM, BEL > UNC, PSS > DIS
Shifting responsibility	3.39 (0.60)	2.05 (0.47)	2.01 (0.56)	3.41 (0.63)	1.62 (0.46)	2.36 (0.60)	F(5721) = 212.57 *	0.60	DIS, BEL > PSS > UNC, ALM > CON
Role of individual	3.95 (0.57)	3.99 (0.50)	4.16 (0.56)	4.37 (0.57)	4.41 (0.53)	3.55 (0.69)	F(5721) = 32.39 *	0.18	CON > ALM, UNC, DIS > PSS; BEL > UNC, DIS > PSS
Apathetic attitudes	3.20 (0.72)	2.33 (0.60)	2.07 (0.58)	2.58 (0.74)	1.67 (0.49)	3.04 (0.67)	F(5721) = 98.78 *	0.41	DIS, PSS > BEL > UNC > ALM > CON
Human-centric	3.56 (0.60)	4.06 (0.65)	3.71 (0.60)	4.31 (0.48)	4.47 (0.45)	2.48 (0.67)	F(5721) = 149.63 *	0.51	BEL, CON > UNC > DIS, ALM > PSS
Resource-centric	4.36 (0.54)	4.73 (0.34)	4.47 (0.46)	4.80 (0.28)	4.81 (0.32)	3.35 (0.89)	F(5721) = 123.62 *	0.46	BEL, CON, UNC > ALM, DIS > PSS
Science-centric	3.36 (0.60)	4.25 (0.52)	2.55 (0.63)	3.95 (0.60)	4.29 (0.58)	2.00 (0.75)	F(5721) = 281.86 *	0.66	UNC, CON > BEL > DIS > ALM > PSS

Note: * $p < 0.0001$; type key: Disconnected (DIS), Uncommitted (UNC), Alarmed (ALM), Believer (BEL), Concerned (CON), Pleasure-seeker (PSS).

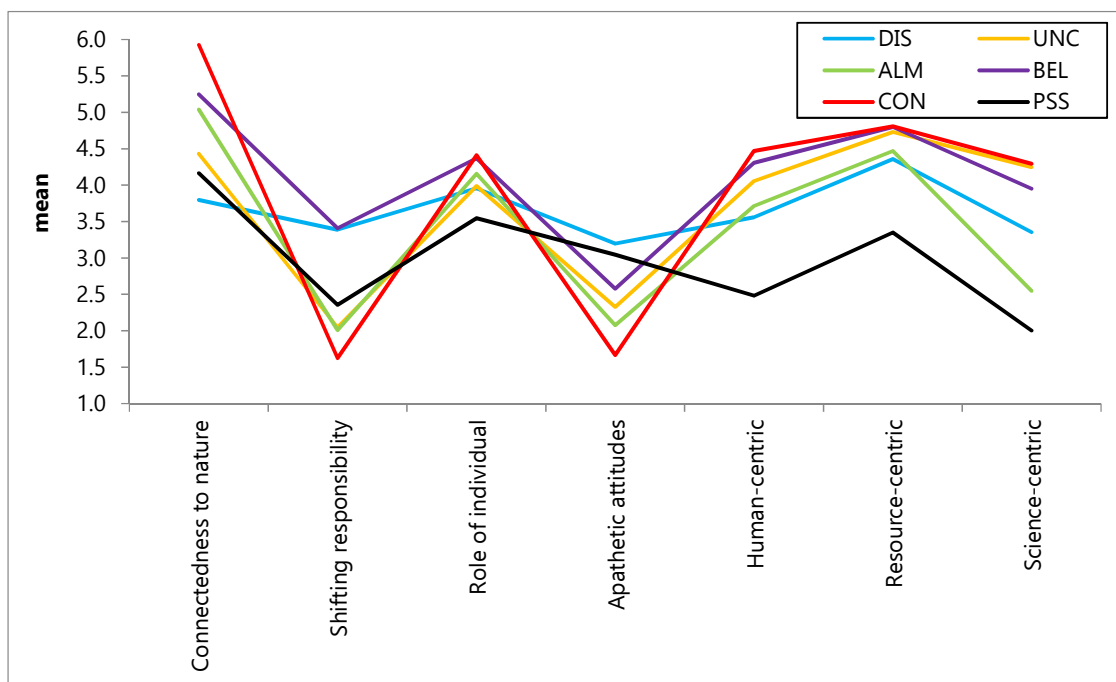


Figure 1. Type similarity and differences on clustering variables. Type key: Disconnected (DIS), Uncommitted (UNC), Alarmed (ALM), Believer (BEL), Concerned (CON), Pleasure-seeker (PSS).

For all clustering variables, the overall ANOVA was significant, and the effects' sizes were moderate to large except where indicated. For connectedness to nature, significant differences were large except for the Alarmed and the Believer (small; $d = 0.39$) and the Uncommitted and the Pleasure-seeker (moderate; $d = 0.51$). The Believer and the Concerned showed a sense of kinship with the biosphere, whereas the Disconnected perceived humans as dominators of nature.

For shifting responsibility, the Concerned felt a sense of urgency and liability relating to environmental and animal issues, whereas the Believer did not. Although the Believer type indicated affect towards nature, they might be feeling powerless to do anything since their focus is on humans.

For role of the individual, the Concerned scored the highest and the Pleasure-seeker the lowest, suggesting that the Pleasure-seeker did not take individual responsibility for environmental issues.

For apathetic attitudes, the effect sizes of significant differences were moderate to large except for the Uncommitted and the Alarmed and between the Uncommitted and the Believer, where the effect sizes were small. The Disconnected and the Pleasure-seeker were the most apathetic and the Concerned the least apathetic. Apathetic attitudes explain why the Pleasure-seeker indicated no sense of individual responsibility towards the environment and a poor relationship with the biosphere.

For human-centric concerns, the Concerned and the Believer scored the highest and the Pleasure-seeker the lowest. Scores suggest that the Believer and the Concerned had a broader degree of concern for human-related issues compared to the Pleasure-seeker, who only focused on themselves.

For resource-centric, all types were concerned about resource-centric issues except for the Pleasure-seeker. This could have been due to a lack of awareness, since environmental issues were not a primary lens for this type. Notably, these issues were a concern for the Disconnected, which might have indicated that these issues impacted them personally.

For science-centric, the Concerned and the Uncommitted scored the highest. The Concerned scored high due to their concerns about all environmental issues. The Uncommitted could have been concerned about these issues for different reasons, and the Pleasure-seeker type were the least concerned.

4.4. Comparing Profiling Variables

4.4.1. Comparing Behavior

The profiling variables used from the BQ were recycle, energy reduction, conscious consumption, environmentally friendly travel, charitable, environmentally conscious travel, individual water reduction, re-use, and smart gardening, as shown in Table 2. Figure 2 is a line graph aimed at showing visually how the types trended across recycle, energy reduction, conscious consumption, environmentally friendly travel, charitable, environmentally conscious travel, water reduction, reuse, and smart gardening.

Table 2. Types and behavior.

Behavioral Variables	DIS N = 75	UNC N = 120	ALM N = 176	BEL N 104	CON N = 170	PSS N = 170	Df/F-stat	η^2	Significant Differences between Types
Recycle	2.59 (1.02)	2.64 (0.96)	2.66 (0.99)	3.08 (1.18)	3.28 (1.09)	2.11 (0.89)	F(5714) = 17.71 *	0.11	CON, BEL > ALM, UNC, DIS, PSS; ALM, UNC > PSS
Energy reduce	4.03 (0.79)	4.18 (0.67)	4.18 (0.59)	4.50 (0.55)	4.47 (0.50)	3.72 (0.77)	F(5714) = 21.44 *	0.13	BEL, CON > DIS, UNC, ALM > PSS
Conscious consumption	3.01 (0.87)	3.11 (0.67)	3.12 (0.66)	3.51 (0.77)	3.67 (0.66)	2.56 (0.76)	F(5714) = 32.46 *	0.19	BEL, CON > DIS, UNC, ALM > PSS
Environmentally friendly travel	2.96 (1.03)	2.62 (0.98)	2.62 (1.00)	3.27 (1.10)	2.73 (1.13)	2.27 (1.01)	F(5714) = 9.79 *	0.06	BEL > CON, UNC, ALM, PSS; DIS > PSS
Charitable	1.91 (1.13)	1.86 (0.90)	1.92 (0.90)	2.27 (1.12)	2.53 (1.05)	1.75 (0.94)	F(5714) = 11.79 *	0.08	CON > ALM, DIS, UNC, PSS; BEL > UNC, PSS
Environmentally conscious travel	3.14 (1.02)	3.37 (0.96)	3.35 (0.96)	3.68 (1.00)	3.90 (0.89)	2.98 (1.07)	F(5714) = 14.23 *	0.09	CON > UNC, ALM, DIS, PSS; BEL > DIS, PSS
Water reduction	3.98 (0.91)	4.31 (0.67)	4.25 (0.72)	4.29 (0.74)	4.49 (0.65)	3.80 (1.05)	F(5714) = 10.82 *	0.07	CON > ALM, DIS, PSS; UNC, BEL, ALM > PSS
Re-use	3.44 (1.00)	3.70 (0.85)	3.62 (0.96)	3.97 (1.03)	3.97 (0.86)	3.21 (1.05)	F(5714) = 10.01 *	0.07	CON > ALM, DIS, PSS; BEL > DIS, PSS; UNC > PSS
Smart gardening	3.00 (1.05)	2.69 (1.11)	2.71 (1.09)	3.19 (1.14)	3.20 (1.01)	2.31 (1.14)	F(5714) = 10.58 *	0.07	BEL, CON > ALM, UNC, PSS; DIS > PSS

Note: * $p < 0.0001$; type key: Disconnected (DIS), Uncommitted (UNC), Alarmed (ALM), Believer (BEL), Concerned (CON), Pleasure-seeker (PSS).

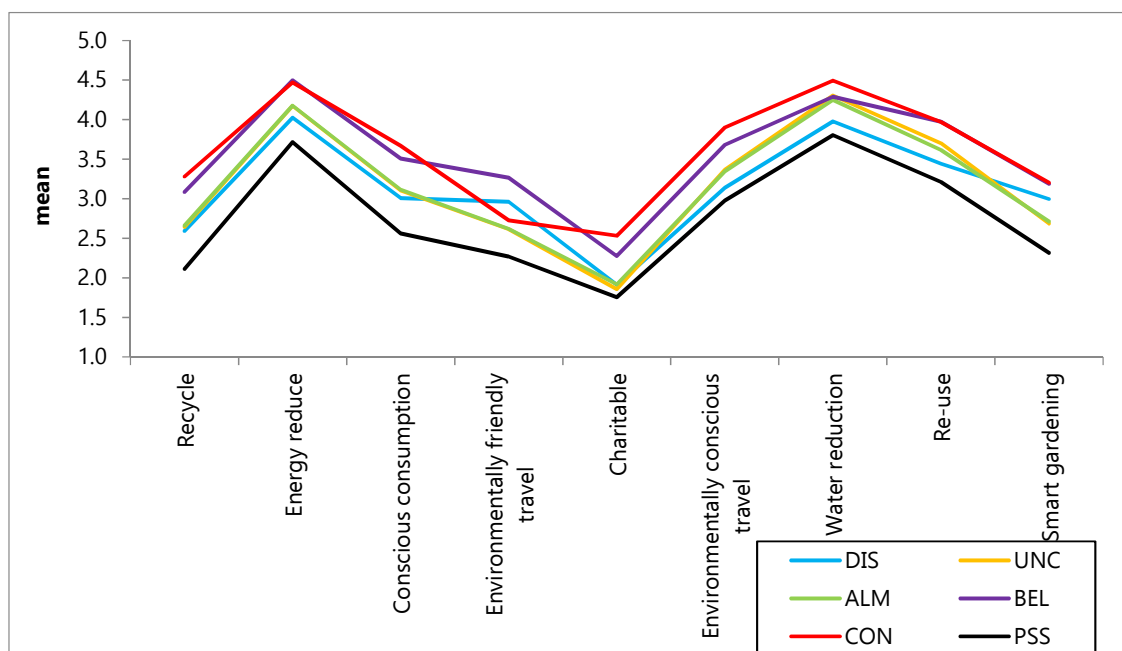


Figure 2. Type similarity and differences on behavior. Type key: Disconnected (DIS), Uncommitted (UNC), Alarmed (ALM), Believer (BEL), Concerned (CON), Pleasure-seeker (PSS).

For all behavioral variables, the overall ANOVA was significant, and the effects' sizes ranged from moderate to large except where indicated. For recycling, the effect sizes were small to moderate except for the Believer, Concerned, and Pleasure-seeker, which were large (the Concerned scored the highest and the Pleasure-seeker the lowest). For reduction in energy, the effect sizes were moderate to large except for the Disconnected and the Pleasure-seeker (small). The Believer scored the highest and the Pleasure-seeker the lowest on energy reduction. The Concerned had the highest conscious consumption compared to the Pleasure-seeker. For environmentally friendly travel behavior, the Believer scored the highest and the Pleasure-seeker the lowest. For charitable behavior, the Concerned scored the highest, possibly because of their outward-focused worldview, which is in contrast to the Pleasure-seeker, who focused on self-pleasure. With a more bio-centric worldview, it makes sense that the Concerned scored the highest and the Pleasure-seeker the lowest on environmentally conscious travel behavior, and the Concerned scored the highest and the Pleasure-seeker the lowest on water reduction. For re-use, the effect sizes were moderate to large except for the Alarmed and the Concerned (small). The Believer and the Concerned scored the highest and the Pleasure-seeker the lowest on re-use. When it comes to smart gardening, the effect sizes were small to moderate except for the Concerned and the Pleasure-seeker, for which the effect size was large where the Concerned scored the highest and the Pleasure-seeker the lowest.

4.4.2. Comparing Values

Table 3 shows the types' performance on each of the values. Figure 3 is a line graph aimed at showing visually how the types trended across conformity, tradition, benevolence, universalism, self-direction, stimulation, hedonism, achievement, power, and security.

Table 3. Types and values.

Value Variables	DIS N = 75	UNC N = 120	ALM N = 176	BEL N = 104	CON N = 170	PSS N = 170	Df/F-stat	η^2	Significant Differences between Types
Conformity	0.48 (0.86)	0.53 (0.78)	0.39 (0.91)	0.70 (0.80)	0.34 (0.83)	0.37 (0.85)	F(5648) = 2.46	0.02	NONE
Tradition	−0.66 (0.93)	−0.90 (1.14)	−1.14 (1.02)	−0.44 (0.86)	−1.19 (1.13)	−0.83 (1.13)	F(5648) = 7.90 **	0.06	BEL > UNC, ALM, CON; DIS > CON
Benevolence	0.41 (0.66)	0.62 (0.68)	0.56 (0.79)	0.60 (0.77)	0.71 (0.64)	0.39 (0.86)	F(5648) = 2.78 *	0.02	NONE
Universalism	0.05 (0.58)	0.52 (0.63)	0.59 (0.61)	0.37 (0.62)	1.02 (0.63)	0.02 (0.67)	F(5648) = 37.97 **	0.23	CON > ALM, UNC, BEL, DIS, PSS; ALM, UNC > DIS, PSS; BEL > PSS
Self-direction	0.45 (0.62)	0.45 (0.71)	0.48 (0.80)	0.31 (0.63)	0.65 (0.82)	0.51 (0.84)	F(5648) = 2.48	0.02	NONE
Stimulation	−0.72 (1.18)	−1.08 (1.04)	−0.81 (1.10)	−0.87 (1.14)	−0.80 (1.16)	−0.69 (1.11)	F(5648) = 1.50	0.01	NONE
Hedonism	−0.57 (1.07)	−0.93 (1.19)	−0.68 (1.05)	−0.86 (1.07)	−1.12 (1.19)	−0.20 (1.17)	F(5648) = 7.89 **	0.06	PSS > BEL, UNC, CON; ALM > CON
Achievement	0.45 (0.78)	0.31 (0.71)	0.27 (0.85)	0.37 (0.75)	−0.12 (0.92)	0.32 (0.78)	F(5648) = 7.48 **	0.05	DIS, UNC, ALM, BEL, PSS > CON
Power	−1.07 (0.92)	−1.64 (0.77)	−1.61 (0.87)	−1.59 (0.98)	−2.08 (0.85)	−1.12 (0.90)	F(5648) = 18.47 **	0.12	DIS, PSS > UNC, ALM, BEL > CON
Security	0.20 (0.67)	0.12 (0.77)	0.04 (0.82)	−0.02 (0.82)	0.04 (0.81)	0.11 (0.79)	F(5648) = 0.78	0.01	NONE

Note: * $p < 0.05$; ** $p < 0.0001$; type key: Disconnected (DIS), Uncommitted (UNC), Alarmed (ALM), Believer (BEL), Concerned (CON), Pleasure-seeker (PSS).

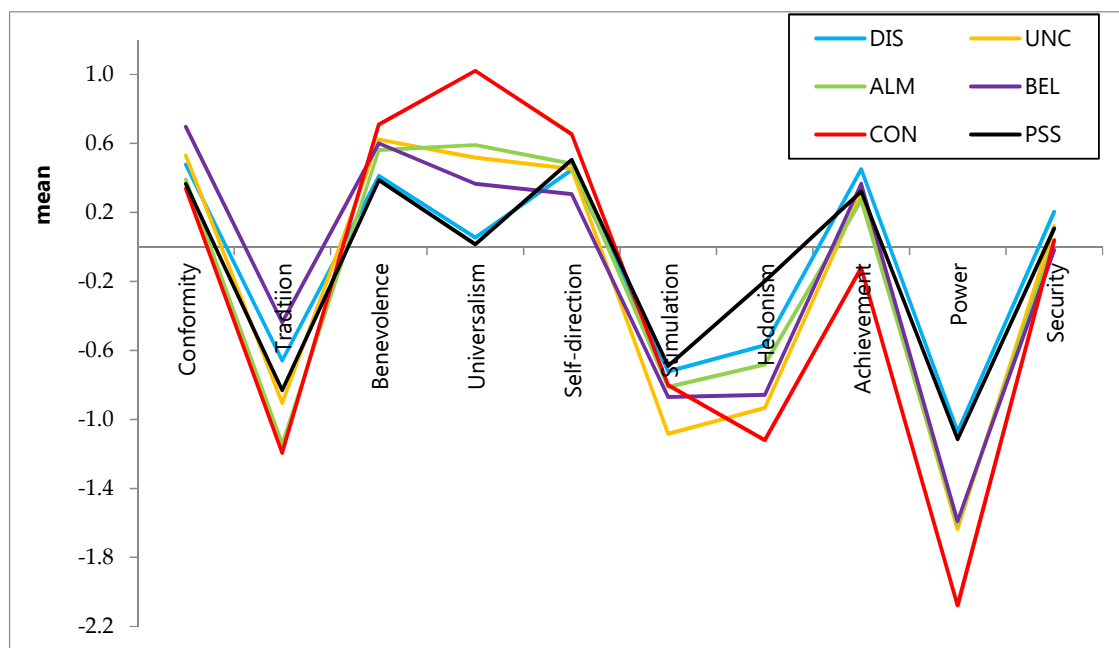


Figure 3. Type similarity and differences on values. Type key: Disconnected (DIS), Uncommitted (UNC), Alarmed (ALM), Believer (BEL), Concerned (CON), Pleasure-seeker (PSS).

For values, the overall ANOVA was significant, except for conformity, self-direction, stimulation, and security. For conformity, the Believer scored the highest, which could relate to their human-centric and religious attitudes, compared to the Concerned, who scored the lowest. For tradition, the effect sizes were small to moderate, and the Disconnected scored the highest and the Concerned the lowest, which suggested that culture and tradition might have played an essential role in how the Disconnected views animals and nature. Although the overall ANOVA was significant for benevolence, the post-hoc tests showed no significant differences between types due to the different group sizes and corrections for Type 1 error in the post-hoc tests. Here the Concerned scored the highest, which showed that they valued constructive relationships, whereas the Pleasure-seeker scored the lowest. For universalism, the effect sizes were moderate to large. The Concerned scored the highest and the Pleasure-seeker the lowest, suggesting that the Pleasure-seeker focused on selfish interests rather than the enhancement of others. For self-direction, the Concerned scored the highest, indicating that they had a sense of independence and freedom compared to the Believer, who scored the lowest. For stimulation, the Pleasure-seeker scored the highest, showing that they required excitement compared to the Uncommitted, who scored the lowest. For hedonism, the effect sizes were small to moderate, where the Concerned scored the lowest and the Pleasure-seeker the highest, indicating that they had a strong desire for positive states of arousal. For achievement, the effect sizes were small to moderate, where the Concerned showed more focus on internal motivations and self-transcendent values rather than achievement compared to the Disconnected, who showed the need to receive social approval and recognition. For power, the effect sizes were moderate to large, and the Concerned scored the lowest and the Disconnected the highest, suggesting that the Disconnected were in search of self-esteem. The Disconnected scored the highest and the Believer the lowest on the value of security, showing differences in their value of safety for society, others, and self.

4.4.3. Comparing Personality

The profiling variables used from the JTI were: extraversion–introversion, sensing–intuiting, thinking–feeling, and judging–perceiving. Type performances are shown in Table 4. Figure 4 is a line graph aimed at showing visually how the types trended dimensionally on extraversion–introversion, sensing–intuition, thinking–feeling, and judging–perceiving.

Table 4. Types and personality.

Personality Variables	DIS N = 75	UNC N = 120	ALM N = 176	BEL N = 104	CON N = 170	PSS N = 170	Df/F-stat	η^2	Significant Differences between Types
Extraversion–Introversion	5.17 (1.72)	5.96 (1.87)	6.34 (2.04)	5.05 (1.61)	6.02 (1.97)	5.95 (2.03)	F(5613) = 6.95 **	0.05	ALM > DIS, BEL; CON, UNC > BEL
Sensing–Intuiting	6.08 (1.04)	6.32 (1.36)	6.35 (1.54)	6.23 (1.15)	6.95 (1.48)	5.88 (1.53)	F(5613) = 7.64 **	0.06	CON > DIS, UNC, ALM, BEL, PSS
Thinking–Feeling	6.42 (1.24)	6.79 (1.19)	6.59 (1.51)	6.48 (1.10)	7.26 (1.29)	6.39 (1.32)	F(5613) = 7.66 **	0.06	CON > DIS, ALM, BEL, PSS
Judging–Perceiving	4.49 (1.32)	4.34 (1.48)	4.37 (1.58)	3.75 (1.22)	4.26 (1.76)	4.84 (1.73)	F(5613) = 3.93 *	0.03	PSS > BEL

Note: * $p < 0.01$; ** $p < 0.0001$; type key: Disconnected (DIS), Uncommitted (UNC), Alarmed (ALM), Believer (BEL), Concerned (CON), Pleasure-seeker (PSS).

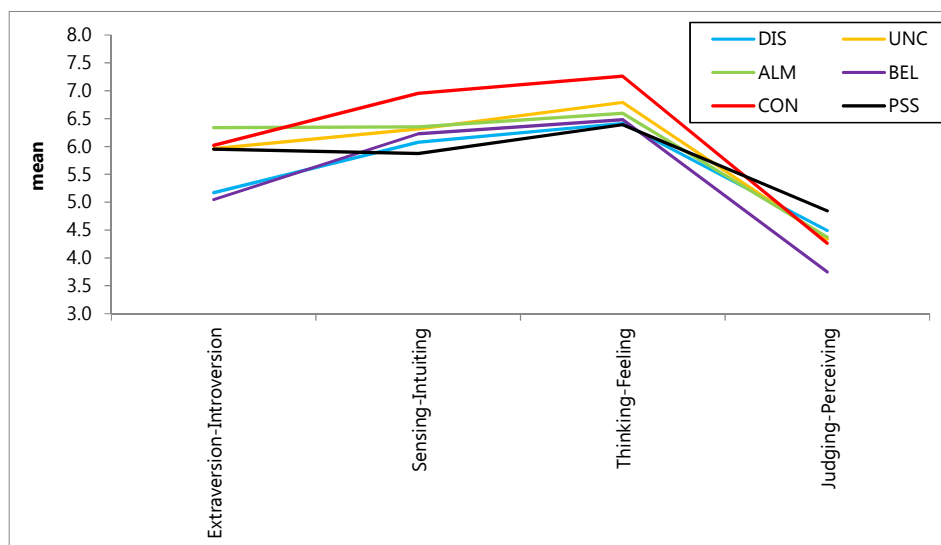


Figure 4. Type similarity and differences on personality dimensions. Type key: Disconnected (DIS), Uncommitted (UNC), Alarmed (ALM), Believer (BEL), Concerned (CON), Pleasure-seeker (PSS).

For all personality dimensions, the overall ANOVA was significant, and the effects sizes ranged from small to moderate. For extraversion–introversion, the Alarmed was closest to introversion, and the Believer was closest to extraversion. The Believer showed a stronger orientation towards the external world, a motivation to influence the outside world, a collective nature, and strong altruism. By contrast, the introverts tended to be more focused on personal factors and oriented towards their inner reality.

For sensing–intuiting, the Concerned were the most intuitive, indicating that they explored broadly the meaning and theory that might influence their experiences, in contrast to the Pleasure-seeker, who scored the highest on sensing.

On the dimension of thinking–feeling, the Concerned were more open to affective relationships that might not be driven by rational thought or processes, in contrast to the Pleasure-seeker, who scored highest on thinking, showing that they tend to be more rational and analytical.

For judging–perceiving, the Believer was a judging type and therefore preferred order and regulation of mental events, whereas the Pleasure-seeker scored higher on impulsivity.

4.5. Comparing Demographic Variables

There was a significant relationship between age groups ($X^2 = 93.20$; $p < 0.0001$), gender ($X^2 = 14.89$; $p < 0.0001$), ethnicity ($X^2 = 115.04$; $p < 0.0001$), religion ($X^2 = 45.54$; $p < 0.0001$), education ($X^2 = 38.17$; $p = 0.0084$), and the types. The Disconnected had the largest number of younger (18–25-year-old) participants compared to the Concerned, which had the most older (46+ year-old) participants. The Alarmed and Concerned had more females compared to the Believer and the Pleasure-seeker, where it was reversed. The Alarmed and Concerned had more White and fewer Black participants compared to the Disconnected and the Believer, where the pattern was reversed. The Concerned had fewer Christian and more non-religious participants compared to the Disconnected and Believer, where the trend was reversed. The Alarmed and the Concerned contained more participants with postgraduate degrees, and the Believer and Pleasure-seeker had fewer participants with postgraduate degrees.

4.6. Comparing Confirmatory Descriptive Variables

The remaining variables (i.e., the NEP, EIAQ climate-centric, animal exploitation, animal extinction, role of government, and the role of technology) were used as confirmatory descriptive variables. The results of these analyses are presented in Table 5. Figure 5 is a line graph aimed at showing visually how the types trended across environmental worldviews, climate-centric, animal exploitation, animal extinction, role of government, and role of technology.

Table 5. Performance on remaining profiling variables that correlated with the clustering variables.

Profiling Variables	DIS N = 75	UNC N = 120	ALM N = 176	BEL N = 104	CON N = 170	PSS N = 170	Df/F-stat	η^2	Significant Differences between Types
Environmental worldviews	3.21 (0.40)	3.70 (0.45)	3.74 (0.54)	3.54 (0.46)	4.11 (0.53)	3.39 (0.55)	F(5714) = 44.86 *	0.24	CON > ALM, UNC, BEL, PSS, DIS; ALM > BEL, PSS, DIS; UNC > PSS, DIS; BEL > DIS
Climate-centric	3.73 (0.71)	3.92 (0.87)	3.49 (0.80)	4.25 (0.75)	4.15 (0.72)	2.50 (0.87)	F(5721) = 60.74 *	0.30	BEL > UNC, DIS, ALM, PSS; CON > DIS, ALM, PSS; UNC > ALM, PSS; DIS, UNC > PSS
Animal exploitation	3.21 (1.04)	3.66 (0.81)	3.40 (0.82)	3.81 (0.86)	4.26 (0.58)	2.75 (0.95)	F(5667) = 41.73 *	0.24	CON > BEL, UNC, ALM, DIS, PSS; BEL > ALM, DIS > PSS; UNC > DIS > PSS
Animal extinction	3.42 (1.04)	4.25 (0.81)	4.01 (0.72)	4.19 (0.80)	4.65 (0.48)	3.18 (1.01)	F(5667) = 46.94 *	0.26	CON > UNC, ALM, BEL > DIS, PSS
Role of government	3.73 (0.72)	3.36 (0.90)	3.35 (0.90)	3.83 (0.85)	3.22 (1.09)	3.41 (0.83)	F(5721) = 7.713 *	0.05	BEL > PSS, UNC, ALM, CON DIS > CON
Role of technology	3.39 (0.77)	2.48 (0.65)	2.72 (0.70)	3.25 (0.80)	2.36 (0.80)	2.86 (0.63)	F(5721) = 34.478 *	0.19	DIS, BEL > PSS, ALM, UNC, CON; PSS > UNC, CON; ALM > CON

Note: * $p < 0.0001$; type key: Disconnected (DIS), Uncommitted (UNC), Alarmed (ALM), Believer (BEL), Concerned (CON), Pleasure-seeker (PSS).

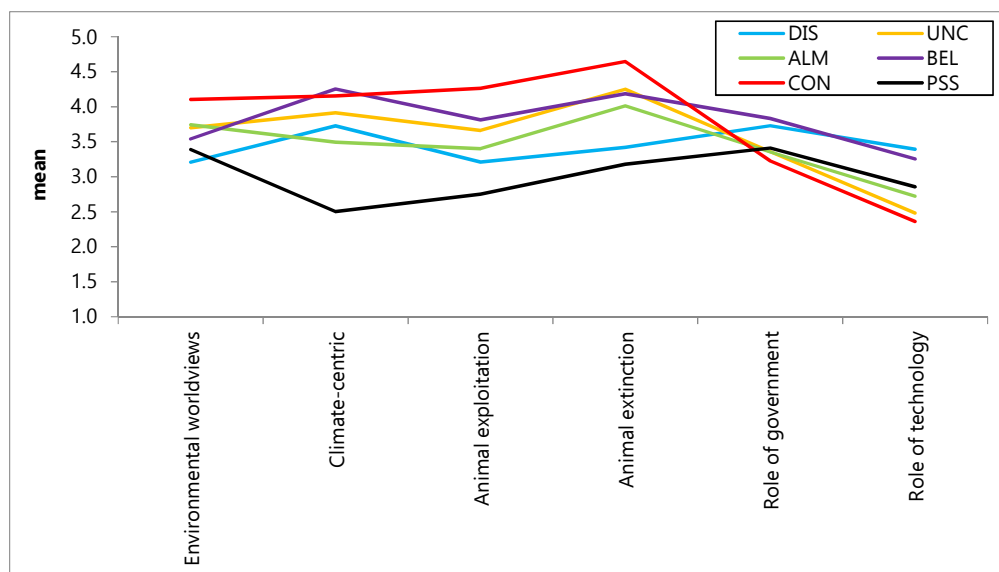


Figure 5. Type similarity and differences on profiling variables. Type key: Disconnected (DIS), Uncommitted (UNC), Alarmed (ALM), Believer (BEL), Concerned (CON), Pleasure-seeker (PSS).

For the confirmatory descriptive variables, the overall ANOVA was significant in each instance, and the effects sizes were moderate to large except where indicated. For environmental worldviews, the effect sizes were moderate to large except between the Uncommitted and the Concerned (small). The Concerned had an ecological worldview, whereas the Disconnected had a dominant social worldview that perceives that nature is for human exploitation. The Believer did not show a strong ecological worldview, but a stronger connectedness to nature score that might suggest that a biophilic affiliation does not necessarily correspond to an environmental worldview.

For climate-centric, the effect sizes were moderate to large except for the Uncommitted and the Concerned (small). The Believer were the most concerned, whereas the Pleasure-seeker were the least concerned. The Believer potentially acknowledged the impact climate-centric issues will have on human-wellbeing.

For animal exploitation, the Concerned expressed the most concern compared to the Pleasure-seeker. This finding suggests that there is some correlation between environmental worldviews and concern for animal welfare and that animal-related issues could be subjectively linked to environmental challenges.

For animal extinction, the Concerned were the most worried and the Pleasure-seeker the least, which can be linked to their difference in scores on universal values. Type scores were generally higher for extinction compared to exploitation, showing that the former is of greater concern to individuals.

As for the role of government, the Believer felt strongly, indicating diffusion of responsibility and perhaps a weak locus of control, whereas the Concerned felt the opposite.

The Uncommitted felt strongly about the role of technology compared to the Concerned. This difference could be due to the younger profile of the Uncommitted, who tended to be more technologically-centric, or it might suggest disinterest in making personal changes.

4.7. Similarity and Differences between Types

Based on the results presented thus far, it is clear that there were some similarities between types, and there were also instances where they might overlap on certain variables. To show similarities and differences per variable, a wheel with integrated mini Venn diagrams was developed and shown in Figure 6. The inner circle of the chart represents the highest scores on each of the variables, moving outward to the lowest scores. The mini Venns are not placed on data-points but rather in relation to one another on a particular variable. Moving from the inner circle further outward, the second circle represents the multiple theoretical frameworks used to construct the study and

includes cognitive, affective, behavioral, and intrinsic constructs. Within these, moving further outward, are the dimensions from which the variables sprout (clustering variables are indicated with a light blue star in the wheel). Types each have their representative color and are placed in relation to one another or overlapping with one another. Distance indicates similarity or difference.

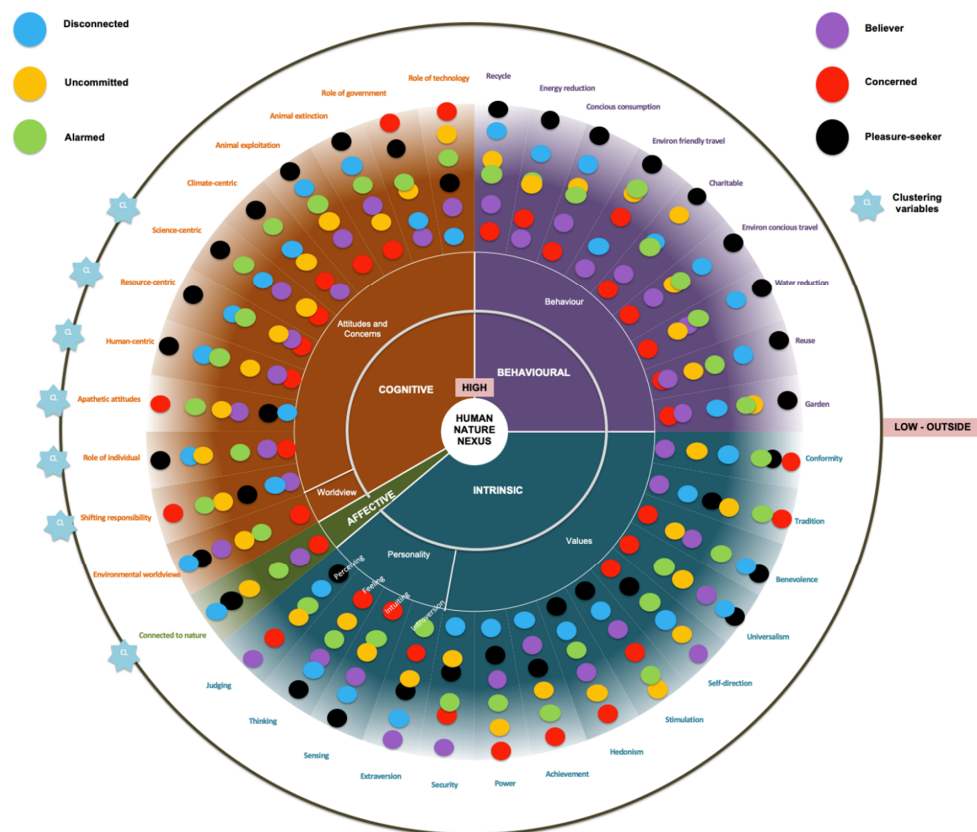


Figure 6. A Venn wheel showing the relationship between types on variables. Type key: Disconnected (DIS), Uncommitted (UNC), Alarmed (ALM), Believer (BEL), Concerned (CON), Pleasure-seeker (PSS).

The Figure shows that the Concerned and the Pleasure-seeker types were often the furthest from each other. The Uncommitted hovered in the middle on many of the variables with close proximity to the Alarmed on certain variables. The Concerned and the Believer were often close on certain variables, just as the Disconnected and Pleasure-seeker were often in close proximity to each other.

5. Discussion

In this study, we aimed to understand the different relationships types of individuals have with the biosphere through exploring differences in intrinsic, affective, cognitive, and behavioral processes. Six well-differentiated types were identified and described, suggesting that the human–nature nexus is complex and that different individual psychological processes impact this relationship. The primary outcome of this study is a deeper and more complete understanding of the human–nature nexus by using a more extensive range of variables. The results reported suggest pathways towards the type of narratives different types might respond to when attempting to increase affective and/or behavioral environmental engagement. To de-emphasize strict boundaries between types, this discussion describes types with overarching aspects in tandem.

The Believer and Concerned types were connected to nature and showed different aspects of congruence with the biosphere. Congruence was expressed as humanistic versus biospheric. They are likely to respond to public social rewards (e.g., praise given for positive goals) [77] with access to salient, digestible scientific information to disseminate this information [78]. Empowering them to participate

in grassroots activism that balances social justice, environmentalism, and civil rights [79], as well as intersectional justice practices, such as coalition politics [80], is likely to appeal to them. Working with them would also mean being aware that they might be at risk of experiencing environmental melancholia [81]. The Believer type was similar to the Concerned [16], Community focused [18], “Man must make use of nature” [82], and Caretaker [83] types in that they had a human-centric view of the biosphere. The Concerned type was similar to many environmentally conscious types, such as the Enthusiasts [18], Greenest Americans [83], and Nature-connected users [84], who all showed concern for the biosphere.

The Uncommitted and Alarmed types showed antagonism, as the Uncommitted tried to remain an observer, and the Alarmed tried to avoid collective approaches. A “feedback-signaling consequence” could provide feedback about their impact on the environment [85]. Further strategies could focus on deepening their relationship with the biosphere with green psychotherapy that educates and counsels [86]. Promoting deep adaptation strategies [87] through the use of empathy and distress [88] could encourage engagement. Community- or family-based interventions [89] or a social norms approach (telling them what other people in their social groups do) [77] has potential, focusing on the nuanced communities of the Alarmed (like activist, vegan, or LGBTI groups), and Believer (religious) [89]. A focus on reducing guilt [78] through low-commitment and active citizenship opportunities that include political activities that are less public or present less risk than engaged activism, for example writing letters to government officials or contributing funds towards environmentally related issues, would have appeal [90]. The Uncommitted type was similar to the Pragmatists and the Community focused [18] in their need to conform. The Murky middles [83], Sideline supporters, and Cautious participants [23] were all similarly uncommitted. The Alarmed type was similar to the Alarmed [16], Humans as potential enemies of nature [91], and Concerned consumer [23] types with their concerns about the biosphere. The Moralistic type [25] were also similar to the Alarmed concerning guilt as a motivator. The Cruel worlders [83] and Activist greens [20] were similar to the Alarmed, who had a negative outlook about the world.

The Disconnected and Pleasure-seeker types were disconnected from the biosphere, and therefore practitioners could focus on ecopsychology activities [92], such as nature-based expressive arts therapy [93] and sensorial activities [94]. Positive incentives [95] for eco-friendly behavior (getting money back for recycling) could adjust behavior without having to address dominant worldviews. Sanctions that disincentivize unsustainable behaviors could be considered [96] in the shape of Pigouvian taxes [97]. Alternative hedonism [98] that positions sustainable behavior as a status symbol, personally rewarding, or a process of individual distinction, rather than based on altruistic concern, could resonate [78]. Any intervention strategies for these types would need to avoid triggering fears of ontological insecurity [99]. The Disconnected type was similar to the Disengaged and Dismissive types [16] with regards to the importance of traditional beliefs. Various types from the literature, including “Man must make use of nature” and “Man must conquer nature” [82], Materialists and UnGreens [83], Nature controllers [84], and Resource-use relationship and No direct relationship [100], were all similar to the Disconnected type with regards to being domineering. The Pleasure-seeker type was similar to Materialists [83], No direct relationship [100], and Apathetic [101] types, who tended to value materialistic goals and were disconnected from the biosphere.

6. Conclusions and Limitations

The key finding of this study was the emergence of types of relationships with the biosphere that are more complete in terms of variables included, such as affect, personality, and values, making the types more descriptive and inclusive compared to previous attempts. The study showed how a combination of emerging intrinsic, cognitive, affective, and behavioral constructs interact to describe the psychological processes that impact the typology–nature nexus. The types identified are not yet complete, but part of a process to set up variables underlying the human–nature nexus with narratives still required for a more extensive and comprehensive understanding. These findings suggest that

intervention approaches that are not nuanced are likely to be ignored by those for whom there is no resonance, reducing the efficacy of environmental messaging and engagement. Designing content with types in mind, rather than using a generic approach for entire populations, allows for environmental strategies to be more focused on individual pathways for attention. The environmental movement would benefit from framing public engagement around aspects that are important to individuals to generate motivation and interest. Of course this contention has not been empirically tested in this study and follow-up research would need to assess whether the proposed interventions resonate with the specific type as hypothesized.

A limitation is the exclusion of individuals who do not have Internet access or who might be illiterate, and therefore the sample is not representative of the entire South African population. The results are generalizable to those of middle and upper incomes, and who had access to the Internet. Because the study was conducted in a particular context, it is not generalizable to other populations. Furthermore, the results do not include the size of each type concerning the general South African population. It is not feasible for others to administer all the scales of the study, as it took participants an average of 64 min to complete the questionnaire battery. This study was used to provide a depth of description, and further discriminant analysis will be conducted to determine whether a shortened version of the questionnaire is feasible. Caution should also be exercised in the interpretations of the comparisons between types based on the confirmatory descriptive variables. As was noted in the methods section, these variables correlated significantly with the clustering variables. They are only presented in this paper for descriptive purposes.

Given the length of the survey (150+ items; 36 variables), future research could measure the size of the different types within the broader global context using a shortened survey. There is also a need for a more in-depth qualitative study to build a richer understanding of the six types. The types emerging from this analysis are based on scales that generalize rather than personalize the experience of the individual. Game theory [102] using typologies might provide insight into how these individuals behave in various situations [103]. Testing various interventions, policy strategies and communication campaigns with types could guide nuanced messaging. The types could be useful for pre-testing communication campaigns as in the case of “day zero” in cities [104]. A study that explores wellbeing correlations with each type could provide valuable insight into wellbeing and human–nature relationships and impetus for where to focus psychological interventions. Investigating how types perceive risk would be useful for climate change strategies.

Author Contributions: Conceptualization, A.M.-P. and A.T.; data curation, A.M.-P.; investigation, A.M.-P.; methodology, A.M.-P. and A.T.; supervision, A.T.; validation, A.T.; writing—original draft, A.M.-P.; writing—review and editing, A.T. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by a Southern African Systems Analysis Centre (SASAC) scholarship and the publication was supported by a University of Witwatersrand Humanities Faculty publication grant.

Acknowledgments: Psychtech for the free use of the JTI and Nudge Now for the use of their online survey platform.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. IPCC (Intergovernmental Panel on Climate Change). *Global Warming of 1.5 Degrees Celsius*; IPCC: Geneva, Switzerland, 2018; ISBN 978-92-9169-151-7. Available online: <http://www.ipcc.ch/report/sr15/> (accessed on 29 October 2018).
2. Fisher, A. *Radical Ecopsychology: Psychology in the Service of Life*; Suny Press: New York, NY, USA, 2013; ISBN 978-1438444765.
3. Wynes, S.; Nicholas, K.A. The climate mitigation gap: Education and government recommendations miss the most effective individual actions. *Environ. Res. Lett.* **2017**, *12*, 074024. [CrossRef]
4. Kollmuss, A.; Agyeman, J. Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environ. Educ. Res.* **2002**, *8*, 239–260. [CrossRef]

5. Baillie, R. Applied Ecopsychology in Australia: Approaches to Facilitating Human-Nature Connections. Gaterings: Seeking Ecopsychology. 8 August 2003. Available online: http://www.ecopsychology.org/journal/gatherings8/html/spirit/applied_baillie.html (accessed on 24 September 2014).
6. Beery, T.H.; Wolf-Watz, D. Nature to place: Rethinking the environmental connectedness perspective. *J. Environ. Psychol.* **2014**, *40*, 198–205. [\[CrossRef\]](#)
7. Colding, J.; Giusti, M.; Haga, A.; Wallhager, M.; Barthel, S. Enabling relationships with nature in cities. *Sustainability* **2020**, *12*, 4394. [\[CrossRef\]](#)
8. Vining, J.; Merrick, M.S.; Price, E.A. The distinction between humans and nature: Human perceptions of connectedness to nature and elements of the natural and unnatural. *Res. Hum. Ecol.* **2008**, *15*, 1–11.
9. Doty, D.H.; Glick, W.H. Typologies as a unique form of theory building: Toward improved understanding and modeling. *Acad. Manag. Rev.* **1994**, *19*, 230–251. [\[CrossRef\]](#)
10. Fiss, P.D. Building better causal theories: A fuzzy set approach to typologies in organization research. *Acad. Manag. J.* **2011**, *54*, 393–420. [\[CrossRef\]](#)
11. Mandara, J. The typological approach in child and family psychology: A review of theory, methods, and research. *Clin. Child Fam. Psychol. Rev.* **2003**, *6*, 129–146. [\[CrossRef\]](#)
12. McKelvey, B. Guidelines for the empirical classification of organisations. *Adm. Sci. Q.* **1975**, *20*, 509–525. [\[CrossRef\]](#)
13. Collier, D.; LaPorte, J.; Seawright, J. Putting typologies to work: Concept formation, measurement, and analytic rigor. *Political Res. Q.* **2012**, *65*, 217–232. [\[CrossRef\]](#)
14. Bailey, K.D. Constructing monothetic and polythetic typologies by the heuristic method. *Sociol. Q.* **1973**, *14*, 291–308. [\[CrossRef\]](#)
15. Kluge, S. Empirically grounded construction of types and typologies in qualitative social research. *Qual. Soc. Res.* **2000**, *1*, 1–11. Available online: <http://nbn-resolving.de/urn:nbn:de:0114-fqs0001145> (accessed on 10 April 2020).
16. Leiserowitz, A.; Maibach, E.; Roser-Renouf, C. *Global Warnings' Six Americas 2009: An Audience Segmentation Analysis*; Yale Project on Climate Change; Yale University and George Mason University: New Haven, CT, USA, 2009.
17. Barnes, A.P.; Toma, L. A typology of dairy farmer perceptions towards climate change. *Clim. Chang.* **2012**, *112*, 507–522. [\[CrossRef\]](#)
18. Poortinga, W.; Darnton, A. Segmenting for sustainability: The development of a sustainability segmentation model from a Welsh sample. *J. Environ. Psychol.* **2016**, *45*, 221–232. [\[CrossRef\]](#)
19. Hall, M.P.; Lewis, N.A., Jr.; Ellsworth, P.C. Believing in climate change, but not behaving sustainably: Evidence from a one-year longitudinal study. *J. Environ. Psychol.* **2018**, *56*, 55–62. [\[CrossRef\]](#)
20. Bernstein, J.; Szuster, B. Beyond unidimensionality: Segmenting contemporary pro-environmental worldviews through surveys and repertory grid analysis. *Environ. Commun.* **2018**, *12*, 1062–1076. [\[CrossRef\]](#)
21. Hunka, A.D.; de Groot, W.T.; Biela, A. Visions of nature in Eastern Europe: A Polish example. *Environ. Values* **2009**, *18*, 429–452. [\[CrossRef\]](#)
22. Buijs, A.E.; Fischer, A.; Rink, D.; Young, J.C. Looking beyond superficial knowledge gaps: Understanding public representations of biodiversity. *Int. J. Biodivers. Sci. Manag.* **2008**, *4*, 65–80. [\[CrossRef\]](#)
23. Department for Environment, Food and Rural Affairs (Defra). A Framework for Pro-Environmental Behaviours. 2008. Available online: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69277/pb13574-behaviours-report-080110.pdf (accessed on 8 March 2015).
24. MacDonald, E.; Harbrow, M.; Jack, S.; Kidd, J.; Wright, A.; Tuinder, P.; Poutasi, M. Segmenting urban populations for greater conservation gains: A new approach targeting cobenefits is required. *Conserv. Sci. Pract.* **2019**, *1*, e101. [\[CrossRef\]](#)
25. Kellert, S.R. American attitudes toward and knowledge of animals: An update. *Int. J. Study Anim. Probl.* **1980**, *1*, 87–119. Available online: <https://animalstudiesrepository.org/ijsap/vol1/iss2/9> (accessed on 10 April 2020).
26. Teel, T.L.; Manfredo, M.J. Understanding the diversity of public interests in wildlife conservation. *Conserv. Biol.* **2010**, *24*, 128–139. [\[CrossRef\]](#) [\[PubMed\]](#)
27. Cini, F.; Leone, L.; Passafaro, P. Promoting ecotourism among young people: A segmentation strategy. *Environ. Behav.* **2012**, *44*, 87–106. [\[CrossRef\]](#)
28. Osherenko, G. Human/nature relations in the Arctic: Changing perspectives. *Polar Rec.* **1992**, *28*, 277–284. [\[CrossRef\]](#)

29. Balderjahn, I.; Peyer, M.; Seegebarth, B.; Wiedmann, K.; Weber, A. The many faces of sustainability-conscious consumers: A category-independent typology. *J. Bus. Res.* **2018**, *91*, 83–93. [CrossRef]
30. Douglas, M.; Wildavsky, A. *Risk and Culture*; University of California Press: Berkeley, CA, USA; Los Angeles, CA, USA, 1982; ISBN 9780520050631.
31. Kahn, P.H.; Lourenço, O. Water, air, fire, and earth: A development study in Portugal of environmental moral reasoning. *Environ. Behav.* **2002**, *34*, 405–430. [CrossRef]
32. Lenzen, M.; Sun, Y.; Faturay, F.; Ting, Y.; Geschke, A.; Malik, A. The carbon footprint of global tourism. *Nat. Clim. Chang.* **2018**, 522–528. [CrossRef]
33. Ndletyana, M. *Middle-Class in South Africa: Significance, Role and Impact*; BRICS Academic Forum: Rio de Janeiro, Brazil, 2014.
34. Gifford, R.; Nilsson, A. Personal and social factors that influence pro-environmental concern and behaviour: A review. *Int. J. Psychol.* **2014**, *49*, 141–157. [CrossRef]
35. Corner, A.; Markowitz, E.; Pidgeon, N. Public engagement with climate change: The role of human values. *WIREs Clim. Chang.* **2014**, *5*, 411–422. [CrossRef]
36. Sabini, M.A. *CG Jung on Nature, Technology and Modern Life*; North Atlantic Books: Berkeley, CA, USA, 2008; ISBN 1556433794.
37. Schwartz, S.H. An overview of the Schwartz theory of basic values. *Online Read. Psychol. Cult.* **2012**, *2*. [CrossRef]
38. Dunlap, R.E. The New Environmental Paradigm scale: From marginality to worldwide use. *J. Environ. Educ.* **2008**, *40*, 3–17. [CrossRef]
39. Lewis, B.R. Influence of the Dominant Social Paradigm on Consumer Environmental Attitudes, Values and Behaviors. Unpublished Doctoral Thesis, The University of Georgia, Athens, GA, USA, 2009.
40. Schultz, P.W.; Shriver, C.; Tabanico, J.J.; Khazian, A.M. Implicit connections with nature. *J. Environ. Psychol.* **2004**, *24*, 31–42. [CrossRef]
41. Swim, J.; Clayton, S.; Doherty, T.; Gifford, R.; Howard, G.; Reser, J.; Weber, E. Psychol. and Global Climate Change: Addressing a Multi-Faceted Phenomenon and Set of Challenges. A Report by the American Psychological Association's Task Force on the Interface between Psychology and Global Climate Change. 2009. Available online: <http://www.apa.org/science/about/publications/climate-change.aspx> (accessed on 10 April 2020).
42. Tauber, P.G. *An Exploration of the Relationships among Connectedness to Nature, Quality of Life, and Mental Health (Unpublished Masters Dissertation)*; Utah State University: Logan, UT, USA, 2012.
43. World Economic Forum. *Global Risks 2014*, 9th ed.; World Economic Forum: Geneva, Switzerland, 2014; Available online: www.weforum.org/risks (accessed on 17 February 2015).
44. Ojala, A. *What Makes Us Environmentally Friendly? Soc. Psychological Studies on Environmental Concern, Components of Morality and Emotional Connectedness to Nature (Unpublished Academic Dissertation)*; University of Helsinki: Helsinki, Finland, 2012.
45. Roszak, T. *The Voice of the Earth: An Exploration of Ecopsychology*; Simon & Schuster: New York, NY, USA, 1992; ISBN 10 1890482803.
46. Semanya, D.K. The making and prevention of rain amongst the Pedi tribe of South Africa: A pastoral response. *HTS Theol. Stud.* **2013**, *69*, 1–5. [CrossRef]
47. Berndt, A.; Gikonyo, L. Environmental concern behaviours in Africa: An exploratory study. *J. Manag. Sustain.* **2012**, *2*, 1. [CrossRef]
48. Herzog, T.; Pershing, J.; Baumert, K.A. Navigating the Numbers: Greenhouse Gas Data and International Climate Policy. World Resources Institute, 2005. Available online: <http://www.wri.org/publication/navigating-numbers> (accessed on 10 April 2020).
49. OECD (Organisation for Economic Co-Operation and Development). *Greening Household Behaviour: The Role of Public Policy*; OECD Publishing: Paris, France, 2011.
50. Zarepour, Z. *Attitudes and Pro-Environmental Consumption Behaviour: An Application of a Choice Experiment in the Netherlands*; International Institute of Social Studies: The Hague, The Netherlands, 2012.
51. LeBaron, M. *Cultural and Worldview Frames. Beyond Intractability*; University of Colorado: Boulder, CO, USA, 2003; Available online: <http://www.beyondintractability.org/essay/cultural-frames> (accessed on 16 September 2015).

52. Markowitz, E.M.; Goldberg, L.R.; Ashton, M.C.; Lee, K. Profiling the “pro-environmental individual”: A personality perspective. *J. Personal.* **2012**, *80*, 81–111. [CrossRef] [PubMed]
53. Diamantopoulos, A.; Schlegelmilch, B.B.; Sinkovics, R.R.; Bohlen, G.M. Can socio-demographics still play a role in profiling green consumers? A review of the evidence and an empirical investigation. *J. Bus. Res.* **2003**, *56*, 465–480. [CrossRef]
54. Milfont, T.L.; Sibley, C.G. The big five personality traits and environmental engagement: Associations at the individual and societal level. *J. Environ. Psychol.* **2012**, *32*, 187–195. [CrossRef]
55. Hurst, M.; Dittmar, H.; Bond, R.; Kasser, T. Relationship between materialistic values and environmental attitudes and behaviors: A meta-analysis. *J. Environ. Psychol.* **2013**, *36*, 257–269. [CrossRef]
56. Psytech. Jung Type Indicator: The Technical Manual. 1998. Available online: <http://www.psytech.co.za/images/PsytechSA/JTI/JTIMAN.PDF> (accessed on 27 January 2015).
57. Stern, P.C.; Dietz, T. The value basis of environmental concern. *J. Soc. Issues* **1994**, *50*, 65–84. [CrossRef]
58. Becker, J.; Engelbrecht, A.; Boonzaaier, M.; Finch, J.D.; Meiring, D.; Louw, G. The measurement of values: A psychometric evaluation of the Schwartz Value Survey in the South African context. *Manag. Dyn.* **2017**, *26*, 21–41. Available online: <http://hdl.handle.net/10520/EJC-a726d5659> (accessed on 10 April 2020).
59. Brandimonte, M.A.; Bruno, N.; Collina, S. Cognition. In *Psychological Concepts: An International Historical Perspective*; Pawlik, P., d’Ydewalle, G., Eds.; Psychology Press: Hove, UK, 2006; pp. 1–22. ISBN 13 978-1841695334.
60. Nilsson, A. *The Psychology of Worldviews: Toward a Non-Reductive Science of Personality*; Media-Tryck: Sölvegatan, Sweden, 2013; ISBN 978-91-7473-553-6.
61. Hergenhahn, B.R. *An Introduction to the History of Psychol*, 3rd ed.; Brooks/Cole: Pacific Grove, CA, USA, 1997; ISBN 9780534060725.
62. Dunlap, R.E.; Van Liere, K.D.; Mertig, A.G.; Jones, R.E. Measuring endorsement of the new ecological paradigm: A revised NEP scale. *J. Soc. Issues* **2000**, *56*, 425–442. [CrossRef]
63. Hawcroft, L.J.; Milfont, T.L. The use (and abuse) of the new environmental paradigm scale over the last 30 years: A meta-analysis. *J. Environ. Psychol.* **2010**, *30*, 143–158. [CrossRef]
64. Mayer, F.S.; Frantz, C.M. The connectedness to nature scale: A measure of individuals’ feeling in community with nature. *J. Environ. Psychol.* **2004**, *24*, 503–515. [CrossRef]
65. Rideout, B.E. The liberal arts and environmental awareness: Exploring endorsement of an environmental worldview in college students. *Int. J. Environ. Sci. Educ.* **2014**, *9*, 59–76. [CrossRef]
66. Stern, P.C.; Dietz, T.; Kalof, L. Value orientations, gender, and environmental concern. *Environ. Behav.* **1993**, *25*, 322–348. [CrossRef]
67. Midgley, G. Ecology and the poverty of humanism: A critical systems perspective. *Syst. Res.* **1994**, *11*, 67–76. [CrossRef]
68. Bandura, A. Impeding ecological sustainability through selective moral disengagement. *Int. J. Innov. Sustain. Dev.* **2007**, *2*, 8–35. [CrossRef]
69. Leopold, A. *A Sand County Almanac and Other Writings on Ecology and Conservation*; Oxford University Press: New York, NY, USA, 1948; ISBN 10 0195007778.
70. Shuey, H. The fundamental principles of typology. *Psychol. Rev.* **1937**, *1*, 170–182. [CrossRef]
71. Fransson, N.; Gärling, T. Environmental concern: Conceptual definitions, measurement methods, and research findings. *J. Environ. Psychol.* **1999**, *19*, 369–382. [CrossRef]
72. Williams, S.P.; Thondhlana, G.; Kua, H.W. Electricity use behaviour in a high-income neighbourhood in Johannesburg, South Africa. *Sustainability* **2020**, *12*, 4571. [CrossRef]
73. McDonald, J.D. Measuring personality constructs: The advantages and disadvantages of self-reports, informant reports and behavioural assessments. *Enquire* **2008**, *1*, 1–19.
74. Hine, C. Internet research and unobtrusive methods. *Soc. Res. Update* **2011**, *61*, 1–4.
75. StatSoft, Inc. STATISTICA (Data Analysis Software System), Version 12. 2013. Available online: www.statsoft.com (accessed on 10 April 2020).
76. Calinski, T.; Harabasz, J. A dendrite method for cluster analysis. *Commun. Stat.* **1974**, *3*, 1–27. [CrossRef]
77. Handgraaf, M.J.J.; Van Lidth de Jeude, M.A.; Appelt, K.C. Public praise vs. private pay: Effects of rewards on energy conservation in the workplace. *Ecol. Econ.* **2013**, *86*, 86–92. [CrossRef]
78. Kwan, V.S.Y.; Naidu, E.S.; Bixter, M.T. Controlling environmental crisis appraisal through knowledge, vividness and timing. *J. Environ. Psychol.* **2019**, *61*, 93–100. [CrossRef]

79. Bullard, R.D.; Johnson, G.S. Environmental justice: Grassroots activism and its impact on public policy decision making. *J. Soc. Issues* **2000**, *56*, 555–578. [CrossRef]
80. Chiro, G.D. Living environmentalism: Coalition politics, social reproduction, and environmental justice. *Environ. Politics* **2008**, *17*, 276–298. [CrossRef]
81. Lertzman, R. *Environmental Melancholia: Psychoanalytic Dimensions of Engagement*; Routledge: London, UK, 2015; ISBN 10 9780415727990.
82. Zheng, Y.; Yoshino, R. Diversity patterns of attitudes toward nature and environment in Japan, USA, and European nations. *Behaviormetrika* **2003**, *30*, 21–37. [CrossRef]
83. Pike, C.; Herr, M.; Minkow, D.; Weiner, H. *The Ecological Roadmap: A Guide to American Social Values and Environmental Engagement*; Earthjustice: San Francisco, CA, USA, 2008; pp. 1–25. Available online: <https://climateaccess.org/system/files/ReGreen%20The%20Ecological%20Roadmap.pdf> (accessed on 26 August 2020).
84. Bauer, N.; Wallner, A.; Hunziker, M. The change of European landscapes: Human-nature relationships, public attitudes towards rewilding, and the implications for landscape management in Switzerland. *J. Environ. Manag.* **2009**, *90*, 2910–2920. [CrossRef]
85. Dwyer, W.O.; Leeming, F.C. Critical review of behavioral interventions to preserve the environment. *Environ. Behav.* **1993**, *25*, 275–321. [CrossRef]
86. Cohen, M.J. *Reconnecting with Nature: Finding Wellness through Restoring Your Bond with the Earth*; Ecopress: Minnesota, MN, USA, 2007; ISBN 13 978-0963970527.
87. Bendell, J. Deep Adaptation: A Map for Navigating Climate Tragedy (IFLAS Occasional Paper). 2018. Available online: <https://www.lifeworth.com/deepadaptation.pdf> (accessed on 10 April 2020).
88. Lee, J.A.; Holden, S.S. Understanding determinants of environ-mentally conscious behavior. *Psychol. Mark.* **1999**, *16*, 373–392. [CrossRef]
89. Kahn, M.E.; Morris, E.A. Walking the walk: The association between community environmentalism and green travel behavior. *J. Am. Plan. Assoc.* **2009**, *75*, 389–405. [CrossRef]
90. Stern, P.C.; Dietz, T.; Abel, T.D.; Guagnano, G.; Kalof, L. A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism. Huxley College on the Peninsulas. 1999. Available online: https://cedar.wvu.edu/hcop_facpubs/1 (accessed on 15 February 2020).
91. Fischer, A.; Young, J.C. Understanding mental constructs of biodiversity: Implications for biodiversity management and conservation. *Biol. Conserv.* **2007**, *136*, 271–282. [CrossRef]
92. Jordan, M. *Nature and Therapy: Understanding Counseling and Psychotherapy in Outdoor Spaces*; Routledge: London, UK, 2015; ISBN 9780415854610.
93. Atkins, S.; Snyder, M. *Nature-Based Expressive Arts Therapy: Integrating the Expressive Arts and Ecotherapy*; Jessica Kingsley Publishers: London, UK, 2018; ISBN 13 978-1785927263.
94. Macy, J.; Brown, M. *Coming Back to Life*; New Society Publishers: Gabriola Island, BC, Canada, 2014; ISBN 10 0865717753.
95. Steg, L.; Vlek, C. Encouraging pro-environmental behaviour: An integrative review and research agenda. *J. Environ. Psychol.* **2009**, *29*, 309–317. [CrossRef]
96. Axon, S. “Keeping the ball rolling”: Addressing the enablers of, and barriers to, sustainable lifestyles. *J. Environ. Psychol.* **2017**, *52*, 11–25. [CrossRef]
97. Glaeser, E.L. The supply of environmentalism: Psychological interventions and economics. *Rev. Environ. Econ. Policy* **2014**, *8*, 208–229. [CrossRef]
98. Soper, K. Re-thinking the ‘good life’: The citizenship dimension of consumer disaffection with consumerism. *J. Consum. Cult.* **2007**, *7*, 205–229. [CrossRef]
99. Andrews, N.; Hoggett, P. Facing up to Ecological Crisis: A Psycho Social Perspective from Climate Psychology. In *Facing Up to Climate Reality: Honesty, Disaster and Hope (Chapter 8)*; Foster, J., Ed.; Publishing Partnership: London, UK, 2019; ISBN 9781907994944.
100. Berghöfer, U.; Rozzi, R.; Jax, K. Local versus global knowledge: Diverse perspectives on nature in the Cape Horn biosphere reserve. *Environ. Ethics* **2008**, *30*, 273–294. [CrossRef]
101. Elgaied, L. Exploring the role of anticipated guilt on pro-environmental behavior: A suggested typology of residents in France based on their recycling patterns. *J. Consum. Mark.* **2012**, *29*, 369–377. [CrossRef]
102. Sigmund, K. *John Maynard Smith and Evolutionary Game Theory*; IIASA Interim Report; IIASA: Laxenburg, Austria, 2005; IR 05-076 2005.

103. Neicu, D. Psychological game theory: A review of current literature. *Rev. Bus. Econ. Lit.* **2012**, *57*, 37–60.
104. Booysen, M.J.; Visser, M.; Burger, R. Temporal case study of household behavioural response to Cape Town’s “Day Zero” using smart meter data. *Water Res.* **2019**, *149*, 414–420. [[CrossRef](#)]



© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).