Relationship Between Value Orientations, Attitudes, and Behavioral Intentions Regarding Peatland Conservation in Finland: An Empirical Application of the Cognitive Hierarchy Model

Ioanna Grammatikopoulou\textsuperscript{a,b}, Pouta Eija\textsuperscript{a}, and Artell Janne\textsuperscript{a}

\textsuperscript{a}Natural Resources Institute Finland (Luke), Helsinki, Finland; \textsuperscript{b}Global Change Research, Institute of the Czech Academy of Sciences, Prague, Czech Republic

ABSTRACT

Peatland conservation is an emerging issue considering the number of ecosystem services these ecosystems provide at the global as well as the local level. Here, we examine how people in Finland value peatlands and how these values are associated with their attitudes toward the ecosystem services that peatlands provide, conservation policy, and their behavioral intention to contribute to conservation. To this end, we use the cognitive hierarchy and employ a protection–use orientation approach. We conclude with four classes of orientation, i.e., conservationists, utilitarians, pluralists, and distanced. The mean values of attitudes and behavioral intentions to a large extent differ significantly across the value orientation classes. The cognitive hierarchy and the notion of value orientations provide a more profound angle of the underlying reasons for people’s views regarding conservation. The findings are context specific but have broader relevance considering the significant role of peatlands in regulating the global climate.

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Introduction

Peatlands are wetland ecosystems of global significance (Bain 2011). They provide various ecosystem services (ES), such as biomass, carbon sequestration, flood control, surface water filtration, habitats for numerous species, and recreational benefits (e.g., Zedler and Kercher 2005; Wichmann et al. 2016). People value peatlands as examples of a cultural landscape (Bullock and Collier 2011) and as a result of strong people–place relationships (Glenk and Martin-Ortega 2018). Preferences for the environmental, health, and cultural values of peatlands (Nath et al. 2017) and for amenity and biodiversity services, in particular (Collier and Scott 2018), have been found in earlier literature. Advocacy for peatland protection is reflected in people’s preferences for the public benefits of restoration (Glenk and Martin-Ortega 2018), as well as in farmers’ willingness to participate in restoration projects (Schaafsma, van Beukering, and Oskolokaite 2017).
Nonetheless, values attached to and perceptions of the nature of peatlands are heterogeneous and may be contradictory, as people can perceive them as deserted areas or as beautiful and wild natural areas and cultural landscapes at the same time (Byg et al. 2017), as well as a source of natural resources such as peat and timber (Nath et al. 2017). Due to this controversy, conservation can only succeed over time if public views and attitudes toward peatlands are acknowledged in the decision-making process.

In Finland, peatlands account for one-third of the land area with a coverage of biotopes that consist of over a hundred different types of peatland (Metsähallitus, State Forest Enterprise 2016). Historically, Finns have had strong connections with peatlands, and have held traditions and beliefs about them for millennia. Peatlands have provided food such as game and berries. Berry picking has been and is part of the Nordic “everyman’s right,” the right to access and use the wilderness without the landowner’s permission (Pouta, Sievänen, and Neuvonen 2006). In this sense, peatlands are an important source of cultural ES such as recreation and landscape amenity services for all citizens. On the other hand, negative attitudes and beliefs have also been found, where peatlands have been seen as ugly, difficult wet terrains and unproductive landscapes with abundant mosquitos and horseflies (Kivelä 2006).

The prevailing belief in Finland until the end of the twentieth century was that peatlands are useful for landowners only after being drained, converted to farmland or used for peat extraction or timber production (Lindholm and Heikkilä 2006). Landowners have drained the majority of peatlands in Finland for forestry use and have performed clearing and drainage for the extraction of peat and in a smaller scale for agricultural use (Simola 2006). The draining of peatlands for forestry typically deteriorates the ecosystem and reduces the berry harvest (Lindholm and Heikkilä 2006). Provision of habitats for animal and plant species is essentially dysfunctional due to peat extraction by mechanical soil practices. Peat extraction and use is responsible for the emission of significant amounts of CO2 into the atmosphere (Martikainen et al. 1995). Although peatlands naturally restore some of the loss in cultural and regulating services after extractive activities end, the process may take decades. Active restoration may speed the recovery, but the results are under ongoing research and in many cases uncertain (Anderson et al. 2016).

The 2018 assessment on threatened types of habitats has indicated 46 undrained peatland habitats in southern Finland out of which 39 were classified endangered and one as near-threatened (Kaakinen et al. 2019). Particularly under threat are fens (nutrient-rich open peatlands) and swamps including coniferous swamps (forested peatlands). In southern Finland, only 2% of the coniferous swamps area is under protection, while when it comes to mires protected area accounts for approximately 9%.

Currently, the Mire Protection Program (MPP, from 1979 and 1981) protects peatlands in national and nature parks, and old forest protection areas. In late 2014, the MPP’s approach was changed from government-enforced to voluntary with the Finnish Ministry of the Environment postponing any further updates. The MPP targeted the conservation of biodiversity through the protection of spatially connected areas with high natural value. When it comes to privately owned areas, the METSO program (the Forest Biodiversity Program for Southern Finland) assumed the responsibility of peatland protection on a voluntary basis. State-owned land of about 6,000 ha is already
under protection status. About 30,000 ha more will be protected in the future (Salomaa, Paloniemi, and Ekroos 2018).

These current developments related to peatlands’ conservation state have increased peoples’ awareness for peatlands’ conservation. The utilization of non-market ES such as carbon storage, water purification, habitat, and cultural services typically antagonizes most economic interests, bringing the discussion of peatland use versus conservation to the forefront (Albrecht and Ratamäki 2016; Salomaa, Paloniemi, and Ekroos 2018). On the one hand, energy self-sufficiency concerns and the political momentum for economic growth that is more bioeconomy-based have catalyzed the utilization of peat for energy purposes. On the other hand, giving up peat energy is one option to reach carbon neutrality in Finland by 2030 (Government Programme 2015).

Several studies from Finland have addressed the issue of peatland conservation and/or restoration and the involvement of different social groups in decision making. Tolvanen, Juutinen, and Svento (2013) grouped citizens into three classes according to their attitudes toward peatland use in a regional case in northern Finland, i.e. environmentalists, production-oriented, and current use supporters. All classes of respondents supported an increase in nature protection and the present level of timber production and disfavored the termination of restoration. Also, past studies confirm the conflict of interests in peatland management (Saarikoski et al. 2019) and the risk of ‘imbalanced involvement of stakeholders’ (Salomaa, Paloniemi, and Ekroos 2018). Such conflicts have become evident in the national policy context for peatlands, where actors who have participated in the recent policy processes (i.e. preparation of the Peatland Strategy and Peatland Protection Program) express different views in relation to the appreciation of ES from peatlands and their incorporation in policy making (Primmer, Saarikoski, and Vatn 2018).

Due to intense policy discussions related to conservation measures and the views expressed in literature, we are interested in understanding the underlying reasons related to how people in Finland perceive peatlands and peatland conservation. People value peatlands in different ways, which may lead to conflicts impeding decision-making mechanisms.

To resolve the possible conflicts, it is useful to acknowledge and comprehend why people value peatlands the way they do. These underlying reasons are reflected in the system of values that people develop for certain topics such as environmental conservation. In this paper, we approach values through value orientations to represent more specific cognitions than general values. The main research questions include: How are Finns classified according to their value orientations in relation to peatlands and what is the profile of these classes? Are these value orientations associated with people’s attitudes and behavioral intentions regarding conservation of peatlands, and how? How are value orientations related to economic values that are elicited in non-market valuation through willingness to pay (WTP) estimates? Do landowners and non-landowners differ along the cognitive hierarchy?

**Conceptual Framework and Methodology**

To explore our research questions, we use a behavioristic framework, i.e. the cognitive hierarchy model, to delineate the relationship between value orientations and
context-specific attitudes and behavioral intentions in a structured way. The latter are revealed through a choice experiment (CE) valuation method. We classify individuals based on their value orientations i.e. protection–use orientations. We aim to reveal the relationship between these classes and a set of external factors, i.e. socio-demographic, spatial, land ownership, and familiarity factors. We use survey-based data from a representative sample and show the correlation between value orientation classes and attitudes toward (i) ES provision, (ii) conservation policy, and (iii) the intention to participate in conservation. Finally, we distinctly examine whether land ownership is related to attitudes and behavioral intentions considering that land ownership reflects human–nature relations and also that a deviation in interests between landowners and non-owners may affect policy implementation.

**Cognitive Hierarchy and Value Orientations**

The cognitive hierarchy is employed as the theory basis for our analysis. This conceptual model has been employed in past environmental studies, e.g. addressing forest management (Vaske et al. 2001), wildlife management policies (Whittaker, Vaske, and Manfredo 2006; Grilli, Notaro, and Campbell 2018), and the management of recreational activities such as hunting (Gamborg and Jensen 2017).

According to cognitive hierarchy, environmental perceptions of individuals can be structured into a model that follows a scheme of values, value orientations (VOs), attitudes, normative beliefs, and behaviors (Homer and Kahle 1988; Rokeach 1973, 1979 in Vaske et al. 2001). This structure is illustrated as an inverted pyramid (Fulton, Manfredo, and Lipscomb 1996; Vaske and Donnelly 1999 in Whittaker, Vaske, and Manfredo 2006), where values indirectly influence behaviors. We use the same structure while adjust it to our context (Figure 1).
Values are core social cognitions that are formed in early childhood and remain stable throughout one’s life (Rokeach 1973 in Vaske et al., 2001). Since values are abstract in the sense that they correspond to people’s stand toward general concepts, e.g. altruism (Whittaker, Vaske, and Manfredo 2006), it is difficult to relate them to specific cognitions or behaviors. This difficulty is resolved with the concept of VOs, which can be more easily measured and linked to specific attitudes (Whittaker, Vaske, and Manfredo 2006; Vaske et al. 2001; Gamborg and Jensen 2017). VOs are described as “basic beliefs” about general objects and correspond to the stance an individual will take when some held values are more important than others. One approach to VOs is to measure general environmental values through latent constructs, i.e. the protection–use or biocentric–anthropocentric continuum, or the “New Environmental Paradigm” (in Whittaker, Vaske, and Manfredo 2006). Another approach refers to the appreciation continuum that reflects the degree of agreement to statements about recreation and learning benefits as well as existence values (Whittaker, Vaske, and Manfredo 2006). Previous studies have suggested that a protection–use orientation approach predicts better specific attitudes related to management actions than the appreciation approach (Bright, Manfredo, and Fulton 2000; Gliner, Vaske, and Morgan 2001; Manfredo, Teel, and Bright 2003; Manfredo and Dayer 2004; Fulton, Manfredo, and Lipscomb 1996 in Whittaker, Vaske, and Manfredo 2006).

Two main classes of VOs are suggested in the literature, i.e. the class of domination orientation and the class of mutualism orientation. The first reflects a utilitarian view of the human–nature relationship and, therefore, nature is managed for human benefits. The latter places nature and human at the same level and nature is valued for its intrinsic/inherent values (Grilli, Notaro, and Campbell 2018; Teel and Manfredo 2010) suggested two other classes, i.e. the class of “Pluralists,” which is related to both utilitarian and mutualist orientations, and the class of “Distanced,” which involves people who care little or not at all about nature.

In this paper, we capture VOs through a set of context specific statements (Table 1, Appendix). In line with the above-mentioned theoretical suggestions, we expect four classes of VOs related to protection–use orthogonal dimensions: the classes of utilitarian, conservationist, pluralistic, and distanced respondents.

Specific VOs are related to the notion of human–nature relationships (Gamborg and Jensen 2017; Grilli, Notaro, and Campbell 2018). Relational values studies emphasize the need to account for the relationships that people hold with nature for being significant determinants of the way values are revealed (Muradian and Pascual 2018; De Vos, Joana, and Dirk 2018), and that it is these relationships that drive decisions rather than the inherent value or benefits per se. The expression of relational values variates across

### Table 1. Descriptive statistics for the full sample.

|                      | Sample      | Population |
|----------------------|-------------|------------|
| Age (mean)           | 52.2        | 42.0a      |
| Gender (% males)     | 54.7        | 49.3a      |
| Educational level (college or higher, %) | 56.8 | 32.5a      |
| Household size (equal to or lower than two members, %) | 70.4 | 75.8a      |
| Median annual household income (gross, €) | 40,000–50,000 | 43,780b |

aStatistics Finland 2016 [www.stat.fi/index_en.html].

bStatistics Finland 2015.
different social groups (De Vos, Joana, and Dirk 2018). Here, we examine the owners versus the non-owners of land in light of past literature findings (Karppinen and Korhonen 2013).

Besides human–nature relationship, the cognitive hierarchy also accounts for other factors that determine VOs. As in past studies, these factors involve socio-demographic variables such as gender, income, education, and residence (e.g. Vaske et al. 2001; Gamborg and Jensen, 2016, 2017), as well as familiarity generated by visiting peatlands (Kiley et al. 2017).

**Data and Methods**

**Survey Implementation**

To apply the cognitive hierarchy in the conservation context for peatlands in Finland, we performed a survey through a structured questionnaire. The approach was pilot tested on a sample of 204 respondents in June 2016. A nationally representative sample was ensured through the utilization of an Internet panel for the final survey that took place between August and October 2016. The respondents were not informed of the survey’s subject in advance to avoid bias based on interest in the subject matter. Technical issues in the responding were addressed by tests in mobile and laptop environments.

Uncertainty over spatial coverage, the related environmental impacts of a protection program that is voluntary together with assumed nonuse values of peatlands led to the decision to sample at national level. Internet panel of Taloustutkimus Oy, which comprises over thirty thousand respondents, uses random sampling in recruiting respondents to guarantee the representativity (Taloustutkimus 2017). The survey was completed by 1997 respondents, after five reminders, accounting for a response rate of 18%. Table 1 presents descriptive statistics for the full sample. In terms of sample characteristics, there was overrepresentation by males and elders of high income and above-average education, and by people living in smaller households (Grammatikopoulou et al. 2020).

**Survey Measures**

The questionnaire was organized into eight parts. Part 1 referred to the general appreciation of peatlands, while Part 2 consisted of assessment questions concerning the cultural ES that are attached to (a) use values after visiting peatlands and (b) nonuse values considering the perceived experience of peatland use through external means (e.g. through communication media). Part 3 corresponded to the assessment of provision and regulating ES and Part 4 to the assessment of protection and use management options. Part 5 introduced the CE for capturing the behavioral intention regarding peatland protection. Part 6 called for respondent perceptions of how additional policy would address the state of ES, and Part 7 focused on the institutional settings. Part 8 was directed to landowners and their intention to participate in peatland protection. The statements of arts 1–4 and 6–8 were measured in a 5-point scale. The final part of the questionnaire incorporated socio-demographic questions. Table 2 presents the links between the aforementioned measures and the cognitive hierarchy.
Factor analysis was performed to reveal how the statements related to peatland protection and use (10 statements) could be grouped under latent attitudinal factors. The scores for the 10 statements were analyzed using principal component analysis with varimax rotation. This method reduces the number of items, as it transforms a larger set of correlated variables into a smaller set of uncorrelated ones. Components were extracted until eigenvalues were less than or equal to 1.0. The factor analysis identified two components, i.e. a peatland protection orientation and a peatland use orientation. A summary of the results is reported in the Appendix, Table 1.

We used summative variables that describe the factors and applied these to construct dummy variables instead of using the factor loadings to facilitate the explanation of our outcome. The summative variables were rounded and then coded into nominal variables (4 or 5 = 3; 3 = 2; and 1 or 2 = 1) according to the level of agreement, resulting in three ratings, i.e. “Agree,” “Indifferent,” and “Disagree.” The classes of orientation were constructed based on the level of agreement and orientation toward peatland protection or use.

**Attitudes: Provision of ES**

Statements in relation to the provision of ES were summarized into three categories, i.e. provisioning, regulating, and cultural, in line with the CICES classification (CICES 2016). Cultural ES were classified into intellectual, physical, and spiritual cultural ES. These three classes were further divided into two groups reflecting use or option values of the ecosystem. A detailed description and summary statistics can be found in Supplementary material in Appendix B.

**Attitudes: Protection Policy and ES**

Statements toward conservation policy and its relation to ES were summarized in the following ES categories, i.e. provisioning, regulating, and cultural. It was expected that additional protection policy would ensure a good preservation state for regulating and
cultural ES at the expense of provisioning ones. A detailed description and summary statistics can be found in Supplementary material in Appendix B.

**Attitudes: Institutions and Policy Implementation**

Factor analysis was employed to summarize the statements related to policy implementation. This analysis identified four components (Table 2, Appendix). The first component refers to an institutional setting of authority-based measures and greater national funding for peatland protection. The second factor describes a multi-objective policy scheme of both protection and use, where less funding should be allocated to strict protection schemes. The third factor advocates private initiatives, and the last factor stresses the moral obligation of landowners to undertake peatland protection. We used summative variables that describe the factors and applied these to construct dummy variables instead of using the factor loadings. Cronbach’s alpha coefficient for the second factor was found to be less than 0.65. We decided, however, to include it in the analysis while acknowledging this limitation.

**Behavioral Intentions: Invest Money in Protection**

To measure behavioral intention, we applied a CE. CE is a stated preference method aiming to reveal individual preferences directly related to the environmental state (Bateman et al. 2002). In a CE, respondents are given a set of choices, each described by different levels of preselected attributes, including also a monetary cost. Respondents are asked to choose the option they preferred most. A status quo alternative may also be part of the choice sets, reflecting the baseline or “no change” situation which is free of cost. In this way, respondents are presented with a tradeoff between changes of preferences and the cost of performing these changes.

Prior to arranging a layman focus group to indicate the most significant services to be assigned as attributes in the CE, an initial expert screening of relevant ES was performed. Subsequently, we used five attributes to describe the effects of mire protection presented in Table 3. We generated 36 choice tasks, blocked into 6 subsets, resulting in 6 choice situations for each respondent. A detailed description of the CE design and data collection is presented in the study by Grammatikopoulou, Pouta, and Artell (2019).

**Statistical Analysis: Differences Between VO Classes**

We performed one-way analysis of variance (ANOVA) to test for statistically significant differences in the mean of (a) sociodemographic, spatial, human–nature relationship, and familiarity factors and (b) attitudes and behavioral intentions and across the protection–use VOs classes. To determine which means in the classes of VOs differ, we employed post hoc pairwise comparison tests. Pairwise comparisons test the difference between each pair of means, indicating whether the means differ at a statistically significant level. We used the least significant difference (LSD) t-test to perform the pairwise comparisons between class means. The test assumes equality of variances. We
performed two-sample t-tests to test for statistically significant differences in the mean of the attitudes and behavioral intentions between landowners and non-landowners.

**Econometric Analysis of Behavioral Intentions Revealed in the CE**

We employed a mixed logit (ML) model with correlated parameters to estimate behavioral intentions to invest money in conservation, i.e. the marginal WTP. The model captures the presence of heterogeneity in respondent preferences (McFadden and Train 2000). All attributes were coded as categorical and parameters were treated as random variables with a normal distribution. The marginal WTP estimate for an attribute for each individual is provided by the ratio of the coefficient for this attribute to the negative of the coefficient for tax payment (Louviere, Hensher, and Swait 2000).

**Results**

**Peatland VO Classes and Their Characteristics**

The analysis revealed the sizes of VO classes (Table 4). Over one-third of the respondents were classified as conservation oriented. Approximately one-fourth were classified as utilitarian and pluralistic, and close to 16% were indifferent toward both the conservation and use of peatlands.

VO classes were described according to the set of external factors of cognitive hierarchy. Table 5 presents the ANOVA results. Male respondents were use-oriented, as indicated by the high male representation in the utilitarian class. Education, income,
and age were not related to the VOs. Altogether, 64% of respondents in the utilitarian class had been raised in a rural area, while 62% of conservationists were represented by urban residents.

Spatial factors were also significantly related to VO classes. Respondents who resided in the west, north, or east of Finland and close to mire or open mire areas were classified as utilitarian or pluralist. Within the utilitarian class, almost 20% of respondents were landowners, which is a significantly higher percentage compared to the other VO classes. Furthermore, pluralistic and utilitarian classes were represented by a higher proportion of users of peatlands as opposed to other VO classes.

**Attitudes and Behavioral Intentions**

**Peatland VO Classes and Attitudes Toward the Provision of ES**

Table 6 reports the relationship between peatland VO classes and attitudes toward the provision of ES. For all types of ES, we found a statistically significant relationship with these attitudes. Provisioning ES were rated higher by respondents with a utilitarian or pluralistic orientation than by those with conservation orientations. Conservationists and pluralists appreciated regulating ES at a higher level than respondents with a utilitarian or distanced orientation. Physical and spiritual cultural ES were favored more than intellectual ES in all orientation classes. Conservationists and pluralists attached a higher value to all types of cultural ES than utilitarian and distanced respondents.

Post hoc analysis revealed that the mean value of ES assessment was significantly different in almost all pairwise comparisons of VO classes. However, there were a few exceptions. Pluralists and utilitarians did not differ in their assessment of provisioning ES. Intellectual ES were also perceived to have the same level of importance among individuals with distant and utilitarian orientations, and among those with pluralistic and conservation orientations. Pluralists and conservationists reported similar ratings for the physical cultural ES.

**Peatland VO Classes and Attitudes Toward Protection Policy**

Statistically significant differences in the means of the statements regarding protection policy and ES provision were observed across VO classes (Table 7). The class of utilitarian respondents was found to agree that additional protection policy may be implemented at the expense of provisioning ES. Conservationists and pluralists, on the other hand, appeared to recognize that protection policy ensures a better state of regulating and cultural ES.

Post hoc analysis revealed that distanced and pluralistic respondents shared common views regarding additional policy and provisioning ES. The classes of distanced and utilitarian respondents were found to disfavor additional protection to safeguard cultural ES.

**Peatland VO Classes and Attitudes Toward Institutions and Policy Implementation**

With reference to policy implementation, our results indicate that conservationists inclined more toward authority-based measures and the necessity for increased funding (Table 8). On the other hand, the class of utilitarian people supported multi-objectivity
Table 5. ANOVA results for the mean value of external factors across VO classes.

| Classes of protection – use VOs | Utilitarian | Conservationist | Pluralistic | Distanced | p-Value |
|--------------------------------|-------------|-----------------|-------------|-----------|---------|
| **Factors**                    |             |                 |             |           |         |
| **Socio-demographic:**         |             |                 |             |           |         |
| Gender (1 = male)              | 0.667       | 0.501           | 0.476       | 0.570     | 0.000   |
| Educational level (1 = college or higher)\(^a\) | 0.665       | 0.670           | 0.628       | 0.612     | 0.190   |
| Gross monthly income (1 = higher than €5000) | 0.436       | 0.414           | 0.402       | 0.398     | 0.663   |
| Age1 (1 = less than 50 years of age)\(^b\) | 0.145       | 0.173           | 0.167       | 0.159     | 0.600   |
| Age2 (1 = 50–65 years of age)   | 0.203       | 0.216           | 0.212       | 0.168     | 0.357   |
| Childhood (1 = raised in a rural area) | 0.635       | 0.479           | 0.513       | 0.476     | 0.000   |
| Urban resident (1 = resides in a city of over 50,000 inhabitants) | 0.512       | 0.618           | 0.577       | 0.589     | 0.003   |
| **Spatial**                    |             |                 |             |           |         |
| Helsinki (1 = individual resides in Helsinki) | 0.227       | 0.332           | 0.291       | 0.359     | 0.000   |
| South (1 = individual resides in southern Finland but not in Helsinki)\(^a\) | 0.187       | 0.241           | 0.226       | 0.243     | 0.121   |
| West (1 = individual resides in western Finland) | 0.277       | 0.259           | 0.248       | 0.172     | 0.006   |
| Northeast (1 = individual resides in eastern or northern Finland) | 0.309       | 0.168           | 0.235       | 0.227     | 0.000   |
| Proximity to a mire (1 = over 1% coverage of mires in the postal code area) | 0.598       | 0.503           | 0.566       | 0.460     | 0.000   |
| Proximity to open mire (1 = over 1% coverage of open mires in the postal code area) | 0.169       | 0.094           | 0.152       | 0.133     | 0.001   |
| **Human–nature relationship** |             |                 |             |           |         |
| Land ownership (1 = Yes)       | 0.197       | 0.107           | 0.128       | 0.155     | 0.000   |
| **Familiarity:**               |             |                 |             |           |         |
| Users (1 = has visited a peatland during the past three years in southern Finland) | 0.605       | 0.574           | 0.717       | 0.456     | 0.000   |

\(^a\)Anova results were tested for a weighted sample where cases are weighted with the age variable to correspond the population. If weighted the difference in the mean for variables "educational level", "age1," and "south" was found statistically significant.
in the sense of incorporating both peatland protection and peat use in policy planning. Pluralists also advocated private initiatives, and the distanced respondent class highlighted the moral obligations of landowners. 

Post hoc analysis revealed that for most of the policy stands, there were statistically significant differences in the means across the VO classes. Distanced respondents agreed

Table 6. ANOVA results for the mean value of attitudes toward ES across VO classes.

| Classes of protection – use VOs | Utilitarian (A) | Conservationist (B) | Pluralistic (C) | Distanced (D) | p-value |
|---------------------------------|-----------------|---------------------|-----------------|---------------|---------|
| Provisioning ES *a*             | 3.892 B D       | 3.043 A C D         | 3.829 B D       | 3.333 A B C   | 0.000   |
| Regulating ES *c*               | 3.815 B C D     | 4.479 A C D         | 4.380 A B D     | 3.686 A B C   | 0.000   |
| Cultural use *b*                |                 |                     |                 |               |         |
| Intellectual use                | 2.255 B C       | 2.681 A D           | 2.608 A D       | 2.113 B C     | 0.000   |
| Physical use                    | 2.990 B C D     | 3.452 A C D         | 3.406 A D       | 2.773 A B C   | 0.000   |
| Spiritual use                   | 2.738 B C D     | 3.734 A C D         | 3.537 A B D     | 2.567 A B C   | 0.000   |

*Note.* The capitals (A, B, and so on) indicate which means in the pairwise comparison differ in the LSD test at the 0.1 significance level.

*The statement is measured on a 5-point scale from 1 = Completely irrelevant to 5 = Very important.

*The statement is measured on a 5-point scale from 1 = Very little to 5 = Very much.

Table 7. ANOVA results for the mean value of attitudes toward protection policy across VO classes.

| Classes of protection – use VOs | Utilitarian (A) | Conservationist (B) | Pluralistic (C) | Distanced (D) | p-value |
|---------------------------------|-----------------|---------------------|-----------------|---------------|---------|
| Additional protection and its outcome on ES *a* |                 |                     |                 |               |         |
| Hinder provisioning ES          | 3.588 B C D     | 2.864 A C D         | 3.143 A B       | 3.214 A B     | 0.000   |
| Safeguard regulating ES         | 3.265 B C D     | 4.386 A C D         | 4.156 A B D     | 3.469 A B C   | 0.000   |
| Safeguard cultural ES           | 3.390 B C       | 4.265 A C D         | 4.118 A B D     | 3.430 B C     | 0.000   |

*Note.* The capitals (A, B, and so on) indicate which means in the pairwise comparison differ in the LSD test at the 0.1 significance level.

*The statements are measured on a 5-point scale from 1 = Completely disagree to 5 = Agree Fully.

Table 8. ANOVA results for the mean value of attitudes toward policy implementation across VO classes.

| Classes of protection – use VOs | Utilitarian (A) | Conservationist (B) | Pluralistic (C) | Distanced (D) | p-value |
|---------------------------------|-----------------|---------------------|-----------------|---------------|---------|
| Policy implementation *a*       |                 |                     |                 |               |         |
| Authority-based and more funding| 2.693 B C D     | 3.684 A C D         | 3.335 A B D     | 3.016 A B C   | 0.000   |
| Multi-objective and less funding| 3.882 B C D     | 3.069 A C D         | 3.699 A B D     | 3.385 A B C   | 0.000   |
| Private initiatives            | 3.6338 B C D    | 3.535 A C D         | 3.741 A B D     | 3.427 A B C   | 0.000   |
| Moral obligations of landowners | 2.365 C D       | 2.468 D             | 2.498 A D       | 2.754 A B C   | 0.000   |

*Note.* The capitals (A, B, and so on) indicate which means in the pairwise comparison differ in the LSD test at the 0.1 significance level.

*The statements are measured on a 5-point scale from 1 = Completely disagree to 5 = Agree Fully.

in the sense of incorporating both peatland protection and peat use in policy planning. Pluralists also advocated private initiatives, and the distanced respondent class highlighted the moral obligations of landowners.

Post hoc analysis revealed that for most of the policy stands, there were statistically significant differences in the means across the VO classes. Distanced respondents agreed
Table 9. ANOVA results for the mean value of behavioral intentions across VO classes.

| Behavioral intentions | Classes of protection – use VOs | p-Value |
|-----------------------|----------------------------------|---------|
|                       | Utilitarian (A) | Conservationist (B) | Pluralistic (C) | Distanced (D) |         |
| a. Willingness to offer suitable areas for protection\(^a,b\) | 2.370 B C | 3.773 A C D | 3.359 A B D | 2.529 B C | 0.000 |
| b. Intention to choose the peatland protection option in all choice sets (Dummy: 1 if yes) | 0.444 B C | 0.867 A C D | 0.720 A B D | 0.495 B C | 0.000 |
| c. WTP for CE attributes (€/respondent per year): | | | | | |
| Carbon storage decrease by 6% | 66.431 B C | 166.450 A D | 136.875 A D | 49.169 B C | 0.005 |
| Species diversity remains at the current level | 212.541 B C | 445.783 A D | 384.547 A D | 211.382 B C | 0.000 |
| Lakes with poor water quality increase by 10 | 131.405 B C | 366.078 A D | 320.081 A D | 188.230 B C | 0.000 |
| Area for berry picking is 850 km\(^2\) | 26.881 B C D | 82.761 A | 69.090 A | 62.354 A | 0.007 |
| Share of peat in domestic energy production decreases by 7% | 40.810 B C | 264.762 A D | 201.531 A D | 81.359 A C | 0.000 |

Note. The capitals (A, B, and so on) indicate which means in the pairwise comparison differ in the LSD test at the 0.1 significance level.

\(^a\)The statements are measured on a 5-point scale from 1 = Completely disagree to 5 = Agree Fully.

\(^b\)Applies only to landowners.
more than the other VO classes that landowners bear a moral obligation toward peatland preservation.

**Peatland VO Classes and Behavioral Intentions**

VOs were significantly related to the intention that landowners expressed to participate in protection policy. Landowners with protection orientation rated this intention higher than landowners with other orientations (Table 9). *Post hoc* analysis revealed a difference in the means across the VO classes. Distanced and utilitarian landowners did not differ at a statistically significant level concerning their intention for action.

Regarding behavioral intentions and their revelation through the CE, conservationists, and pluralists intended to choose protection options over the current policy status, under which peatlands are degraded because of extensive use (Table 9). Distanced and utilitarian classes revealed similarities in intentions according to *post hoc* analysis. Respondents with conservation and pluralistic orientations were willing to pay significantly higher taxes for environmental attributes than those with utilitarian and distanced orientations. This was particularly apparent for improving the state of biodiversity and the quality of water bodies. *Post hoc* analysis demonstrated that for almost all attributes with the exception of “area of berry picking,” utilitarian and distanced respondents reported a similar WTP. A similar finding was noted for conservationist and pluralist classes. For the berry picking attribute, utilitarian respondents stated the smallest WTP compared to all other VO classes.

**Landowners Versus Non-Landowners**

Table 10 reports the difference in the means of attitudes and behavioral intentions between owners and non-owners of land. We only found statistically significant differences at $p < 0.1$ in policy-related attitudes. Landowners were more skeptical than non-owners toward additional protection measures that would ensure the conservation of regulating and cultural ES. They were also more inclined toward private initiatives and less toward mandatory authority measures than non-owners and stated strong disagreement with protecting the ecosystem out of moral responsibility. For all environmental attributes, we found a lower intention to invest, as reflected by the lower WTP estimates for landowners than for non-owners, but the difference in means was only statistically significant at $p < 0.1$ for water quality and energy attributes.

**Discussion and Conclusions**

This paper outlines the association between value orientations (VOs) and context-specific attitudes and behavioral intentions regarding peatland conservation. The cognitive hierarchy served as the conceptual model. VOs and attitudes were elicited through attitudinal questions, while behavioral intentions were revealed from a choice experiment (CE), both being part of a questionnaire-based survey.

We identified four classes of VOs i.e. conservationists (36%), utilitarians (25%), pluralists (23%), and distanced (16%). Karppinen and Hänninen (2000) classified respondents into similar groups in a study related to forest conservation in Finland some
Table 10. T-test results between landowners and non-landowners.

| Attitudes                                      | Mean (Landowners) | Std. deviation (Landowners) | Mean (Non-landowners) | Std. deviation (Non-landowners) | t     | p-Value (2-tailed) |
|------------------------------------------------|-------------------|----------------------------|-----------------------|---------------------------------|-------|-------------------|
| Importance of ES provision                    |                   |                            |                       |                                 |       |                   |
| Provisioning\(^a\)                            | 3.551             | 0.911                      | 3.473                 | 0.895                           | 1.367 | 0.172             |
| Regulating\(^a\)                              | 4.074             | 0.742                      | 4.183                 | 0.700                           | −2.407| 0.016             |
| Cultural use\(^b\)                            |                   |                            |                       |                                 |       |                   |
| Intellectual use                              | 2.586             | 0.922                      | 2.480                 | 0.881                           | 1.640 | 0.101             |
| Physical use                                  | 3.276             | 0.763                      | 3.251                 | 0.724                           | 1.640 | 0.101             |
| Spiritual use                                 | 3.211             | 1.090                      | 3.348                 | 1.026                           | 0.466 | 0.641             |
| Cultural experience\(^b\)                     |                   |                            |                       |                                 |       |                   |
| Intellectual experience                       | 2.784             | 0.875                      | 2.771                 | 0.902                           | −1.812| 0.070             |
| Physical experience                           | 3.466             | 1.029                      | 3.495                 | 1.073                           | 0.238 | 0.812             |
| Spiritual experience                          | 3.392             | 1.010                      | 3.525                 | 0.979                           | −0.414| 0.679             |
| Additional protection and its outcome for ES\(^c\) |                   |                            |                       |                                 |       |                   |
| Hinder provisioning ES                        | 3.265             | 0.955                      | 3.148                 | 0.865                           | 2.084 | 0.037             |
| Safeguard regulating ES                       | 3.721             | 0.943                      | 3.942                 | 0.862                           | −3.947| 0.000             |
| Safeguard cultural ES                         | 3.707             | 1.053                      | 3.912                 | 0.936                           | −3.355| 0.001             |
| Policy implementation\(^c\)                   |                   |                            |                       |                                 |       |                   |
| Authority-based and more funding              | 2.982             | 0.966                      | 3.296                 | 0.837                           | −5.713| 0.000             |
| Multi-objective and less funding              | 3.537             | 0.839                      | 3.457                 | 0.756                           | 1.628 | 0.104             |
| Private initiatives                           | 3.703             | 0.840                      | 3.572                 | 0.765                           | 2.626 | 0.009             |
| Moral obligations of landowners               | 2.332             | 1.262                      | 2.520                 | 1.106                           | −2.999| 0.009             |
| Behavioral intentions                         |                   |                            |                       |                                 |       |                   |
| a. Intention to choose the peatland protection option in all choice sets (dummy: 1 if yes) | 0.625             | 0.485                      | 0.677                 | 0.468                           | −1.701| 0.089             |
| b. WTP for CE attributes (€/respondent per year) |                   |                            |                       |                                 |       |                   |
| Carbon storage decrease by 6%                 | 75.125            | 607.143                    | 121.534               | 586.247                         | −1.198| 0.231             |
| Species diversity remains at the current level| 272.289           | 867.696                    | 343.890               | 833.666                         | −1.299| 0.194             |
| Lakes with poor water quality increase by 10% | 156.670           | 888.409                    | 284.423               | 872.155                         | −2.223| 0.026             |
| Area for berry picking is 850 km\(^2\)       | 41.334            | 315.250                    | 65.259                | 267.258                         | −1.326| 0.185             |
| Share of peat in domestic energy production decreases by 7% | 71.912            | 700.896                    | 177.829               | 695.566                         | −2.315| 0.021             |

\(^a\)The statement is measured on a 5-point scale from 1 = Completely irrelevant to 5 = Very important.

\(^b\)The statement is measured on a 5-point scale from 1 = Very little to 5 = Very much.

\(^c\)The statements are measured on a 5-point scale from 1 = Completely disagree to 5 = Agree Fully.
twenty years ago. The share of classes slightly differed from our findings, e.g. utilitarians represented approximately 34% of the sample, while 24% of respondents were conservationists. It is possible that preferences in Finland have shifted over the course of years toward conservation considering the current environmental state of peatlands.

The four classes of VOs were described based on socio-demographic, spatial, and human–nature relationship factors. We found that gender, the childhood living environment, the place of residence, land ownership, and the use of peatlands were related in a statistically significant way with VO classes. Similarly, a US study by Vaske et al. (2001) reported the relationship between demographic factors, such as the length of stay in the state under study, income, gender, and education, and VOs.

VOs were spatially diversified, with conservation supporters tending to be located in the south and more precisely around the Helsinki capital area. Conservation skeptics were mainly from the northeastern and western parts of Finland, which are more rural and dependent on peatland resources. This implies that conservation schemes would be less “welcomed” in the peatland-rich areas, while being supported in southern Finland. Similar findings are reported in Byg et al. (2017) study.

VO classes appreciated ecosystem services (ES) in a different way. For example, conservationists and pluralists appreciated regulating ES more than utilitarian or distanced respondents. The difference in appreciation between classes characterizes the conflict between peat extraction and carbon storage, as well as water quality. The conflict is of high relevance in the Finnish context, where decisions are being made on future peat extraction for energy use purposes (Government Program 2019) or for horticulture, both of which rapidly release carbon into the atmosphere (Lindholm and Heikkilä 2006). Furthermore, decisions regarding water conservation are continuously topical, and peatlands are the primary source of dissolved organic matter in runoff water in Finland (Lindholm and Heikkilä 2006). Saarikoski et al. (2019) demonstrated this conflict, and in our study, this was reflected in our VO classes.

Among cultural ES, physical and spiritual uses were rated higher by conservationists and pluralists than utilitarian and distanced respondents. For all VO classes these ES were more highly appreciated than intellectual cultural ES. The high appreciation of physical cultural ES is expected considering that in Finland, outdoor recreation activities such as berry picking are very popular and seen as a traditional right of open access to both private and public lands (Pouta, Sievänen, and Neuvonen 2006).

Conservationists indicated higher interest than utilitarian and distanced respondents toward additional conservation measures that benefit regulating and cultural ES. Moreover, conservationists were more inclined toward authority-based measures and the necessity for increased funding, while utilitarians supported multi-objectivity in policy planning, pluralists advocated private initiatives, and distanced respondents highlighted the moral obligations of landowners. In these policy attitudes, we observed statistically significant differences in all pairwise comparisons across VO classes, implying a great challenge in policy planning. A combination of policy instruments as suggested in Salomaa, Paloniemi, and Ekroos (2018) could be considered so as to overcome this challenge.

Behavioral intentions expressed either through willingness to participate in conservation policy (relevant for landowners only) or through WTP for conservation policy were found
to vary according to the VOs. Landowners who were classified as conservationists were more willing to offer land for conservation than landowners with other VOs. Conservationist and pluralist individuals intended to choose protection options away from the status quo and were willing to pay more for conservation compared to other VO classes.

Peatland diversity showed the highest WTP across all VO classes. This is of no surprise considering that peatlands provide unique habitats for specialized species and species communities that cannot be substituted with other habitats (Similä, Kaisu, and Penttinen 2014).

Overall, we found consistency between VOs and WTP estimates elicited from the CE. This implies a good expectation-based validation of the outcomes of the CE given that stated preferences studies often deal with validity issues. It also is line with the findings of Grilli, Notaro, and Campbell (2018), and the incorporation of VOs in a hybrid latent class model.

We also examined whether all the above attitudes and behavioral intentions differed significantly between landowners and non-landowners. According to our results, 63% of landowners and 67% of non-landowners would be willing to support the funding of a conservation plan. Tolvanen, Juutinen, and Svento (2013) reported similar estimates. A study by Salomaa, Paloniemi, and Ekroos (2018) exploring peatland management in Finland revealed that 47% of landowners were positive toward the conservation of their own peatland. Landowners reported lower WTP for conservation than non-owners but statistically significant differences were only detected for the attributes that described the change in water quality and in the share of peat use. Statistically significant differences were also observed for protection policy and policy implementation attitudes, with landowners having a more critical stance toward policy for the sake of regulating and cultural ES, and inclining more toward private initiatives as opposed to mandatory authority-based measures than non-owners. The latter possibly reflects the perceived right of landowners to decide on their land management (Saarikoski et al. 2019).

The share of classes in VOs indicated that one out of three citizens was conservation oriented. VOs can provide a positive indication of a stable attitude toward conservation, ensuring in a way that conservation schemes have a good possibility of being endorsed. On the other hand, as stated in former studies, exactly because VOs show more resistance to change than attitudes that are more specific (Rokeach 1973; Stern 2000; Manfredo, Teel, and Bright 2003; Manfredo and Dayer 2004), the resolution of issues that are based on values can be challenging.

The cognitive hierarchy provides more in depth understanding for ES evaluations. Our outcomes may be of use in policy design, by incorporating value-level concepts in policy makers’ strategy and programs (Whittaker, Vaske, and Manfredo 2006) and by tailoring policy schemes toward certain ES. Our findings may complement the suggestions presented in Primmer, Saarikoski, and Vatn (2018) that stress the need for a better understanding of ES values in decision making.

Our methods did not allow the illustration of any causal effects between VOs and the other elements of the cognitive hierarchy. A more elaborated model such as a structural equation model could provide the predictive power of VOs but such an attempt was beyond our scope. Furthermore, we showed the relationship between VOs and behavioral intentions ignoring real behavior or actions. Hence, our findings are indicative and
should be interpreted with care, accounting for a certain degree of uncertainty. Finally, as mentioned above, VOs were context specific, reflecting the respondents’ orientations toward peatlands per se. A more profound analysis could be achieved by using VOs in a generic context, e.g. considering ecosystem conservation in general.

Our empirical study concludes that VOs for peatlands are related to more concrete cognitions such as attitudes and intentions, and if these links are acknowledged and accounted for in conservation policy planning, conflicts may more easily be resolved, increasing the chances of a positive policy outcome (Byg et al. 2017). Such a recommendation is important for peatland conservation, not only from a country-level perspective but also more broadly, considering the role that peatlands in Finland play in regulating global climate (Similä, Kaisu, and Penttinen 2014).

Notes
1. The content of ‘everyman’s right’ is described in guidelines provided by the Ministry of Environment in https://www.ymparisto.fi/en-us/nature/everymans_rights
2. The hydrological condition of undrained peatland patches varies across the climatic zones of Finland, with the 27.1%, 41.3%, and 15.6% of them classified as ‘weakened’ in the southern, middle, and northern boreal zone, respectively (Sallinen et al. 2019).
3. The former values, defined as held values, reflect first-order preferences that affect the latter values, defined as expressed or ascribed values, which are considered as second-order preferences (Lockwood, 1997; Grilli et al. 2018).
4. Examples from previous literature refer to the use of structured surveys for wildlife VOs (e.g. Grilli et al. 2018; Gamborg and Jensen 2016) and statements are predetermined.
5. Relational values framework outlines the environmental values i.e. the expression of care of people given their relation to nature and can be viewed in terms of place attachment, stewardship and local ownership (Chapman et al. 2019).
6. The initial screening was conducted together with the planners and researchers from the national environmental administration.

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ORCID
Ioanna Grammatikopoulou http://orcid.org/0000-0002-9621-8279
Pouta Eija http://orcid.org/0000-0002-4580-1237
Artell Janne http://orcid.org/0000-0002-9833-5903

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### Appendix A

**Table 1.** Summary statistics and results of factor and reliability analysis of value orientations statements\(^a\) towards peatland protection-use.

| VO: towards protection\(^b\) | Mean | Std. dev. | Component loading | Cronbach’s alpha if item deleted | Cronbach’s alpha |
|-----------------------------|------|-----------|-------------------|----------------------------------|-----------------|
| The good status of peatland nature has an especially great bearing on me. | 3.457 | 1.037 | 0.728 | 0.869 |
| I am pro-peatland protection. | 4.027 | 1.012 | 0.861 | 0.841 |
| More peatlands should be protected than currently are. | 3.673 | 1.108 | 0.864 | 0.833 |
| (All) Drained peatlands should be returned to a natural state. | 3.334 | 1.106 | 0.696 | 0.865 |
| Peatlands are less important than other natural environments. | 2.208 | 1.063 | -0.713 | 0.874 |
| Enough nature is already protected in Finland. | 2.616 | 1.243 | -0.749 | 0.854 |
| VO: towards peat use\(^b\) | | | | | 0.679 |
| Peatland protection and economic utilization are equally important in my opinion. | 3.194 | 1.149 | 0.651 | 0.665 |
| The use of peat in energy production is supportable. | 3.039 | 1.126 | 0.749 | 0.476 |
| It is important to take care of energy self-sufficiency. | 4.117 | 0.831 | 0.679 | 0.686 |
| Energy self-sufficiency cannot be used as an argument for using peat as an energy source. | 3.064 | 1.157 | -0.659 | 0.584 |

KMO and Bartlett’s Test: 0.877. Approx. chi-square: 8539.512 sig: 0.000.

\(^a\)The statements are measured on a 5-point scale from 1 = Completely disagree to 5 = Agree fully.

\(^b\)All items included in the summative variables that had a negative factor loading were reverse-coded.
Table 2. Summary statistics and results of factor and reliability analysis of statements\(^a\) related to policy implementation

|                                | Mean  | Std. dev. | Component loading | Cronbach’s alpha if item deleted\(^c\) | Cronbach’s alpha |
|--------------------------------|-------|-----------|-------------------|----------------------------------------|------------------|
| **Authority-based and more funding\(^b\)** |       |           |                   |                                        |                  |
| Protection can only be successfully implemented by non-voluntary actions. | 3.252 | 0.864     | 0.783             | 0.695                                  |                  |
| Protection primarily succeeds with voluntary actions | 2.778 | 1.147     | −0.573            | 0.579                                  |                  |
| The only way to safeguard peatlands’ nature values is to have authority-based protection. | 3.172 | 1.124     | 0.848             | 0.577                                  |                  |
| Too little money is used for nature protection. | 3.439 | 1.123     | 0.532             | 0.690                                  |                  |
| **Multi-objective and less funding\(^b\)** | 3.468 | 0.769     |                   |                                        | 0.470            |
| In implementing peatland protection, the needs of energy production must be taken into account. | 3.190 | 1.090     | 0.759             | 0.207                                  |                  |
| Peatlands should be primarily protected on nationally owned lands. | 3.557 | 1.062     | 0.652             | 0.517                                  |                  |
| The economic use of peatlands and their protection are integrable. | 3.679 | 0.945     | 0.536             | 0.359                                  |                  |
| **Private initiatives\(^b\)** | 3.591 | 0.778     |                   |                                        | /                |
| Protection can be implemented by establishing private protection areas. | 3.456 | 0.919     | 0.769             | /                                      |                  |
| Peatlands cannot be protected without the initiative of private landowners | 3.349 | 1.002     | 0.637             | /                                      |                  |
| Moral obligations of landowners |       |           |                   |                                        |                  |
| Landowners should not be compensated for protecting peatlands. | 2.494 | 1.131     | 0.909             | /                                      |                  |

KMO and Bartlett’s Test: 0.705. Approx. chi-square: 2756.196. sig: 0.000.

\(^a\)The statements are measured on a 5-point scale from 1 = Completely disagree to 5 = Agree fully.
\(^b\)All items included in the summative variables that had a negative factor loading were reverse-coded.
\(^c\)We report Cronbach’s alpha for summative variables that include more than two items.
