

Human-Nature Relationships and Linkages to Environmental Behaviour

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Abstract

While many theories exist to enlighten the complexity of environmental behaviour, the role of individuals' relationship with nature has not yet been fully clarified. This paper attempts to operationalize human-nature relationships. It expands a scale assessed in an iterative process of mixed-methods in the US and Europe. This scale is then used to assess individuals' relationship with nature and whether such relationships correlate with environmental behaviour. The value scale of Schwartz's Theory of Basic Values is used to validate the results. The results verify that people hold multiple human-nature relationships, confirm strong correlations between human-nature relationships and values, and reveal that individuals' behaviour is connected to the relationship they have with nature.

Keywords: human-nature relationship scale, Schwartz value scale, student survey, Austria, Utah

1 Introduction

This paper shows that considering the relationship humans have with nature enlightens environmental behaviour. In addition to many other aspects of environmental communication and governance, understanding the umbrella concept of human-nature relationships (herein abbreviated as "HNR") helps to recognize "hierarchical views toward nature as well as their effects on behaviours" (Milfont et al. 2013: 10).

Serious environmental problems, such as pollution, scarcity of drinking water, overexploitation of resources, and the loss of biodiversity, are often a consequence of human activities (Vlek and Steg 2007; Klöckner 2013; Steg et al. 2014). Steg et al. (2014: 106) see this as an opportunity because it gives people the chance to manage these problems “[...] by changing the relevant behaviours so as to promote environmental quality”. As easy as that may sound, the challenge to change individual behaviours and stimulate a long-lasting transition towards rebalancing the relationship of society and nature is tremendous. Human behaviour is characterized by a multiplicity of variables, circumstances and interactions with other humans (Teixeira 2007). This implies that comprehending environmental behaviour is anything but simple and predicting it might even be impossible.

Three major frameworks tackle the challenge to link the two dimensions of human behaviour and nature at the societal level. Today’s most frequently discussed framework is that of ecosystem services (ES) (MEA 2005; TEEB 2010). It bridges the human and the natural system, highlighting the importance of ecosystems and biodiversity for human wellbeing and utility (Raymond et al. 2013). A cause-effect approach is applied by the European Environment Agency in the DPSIR framework (driving forces - pressures - state - impact - responses) that analyses how social and economic developments exert pressure on the environment (Agu 2007). More complexity is introduced by Ostrom’s (2009) social-ecological systems (SES) framework, which conceptualizes human resource uses as embedded in complex, social-ecological systems with tiered subsystems and variables interacting on multiple levels.

However we capture the relationship between humans and nature, each approach has its strengths and limitations. Scholars critically reviewing sustainability concepts (e.g. Benson and Craig 2014; Casado-Asensio and Steurer 2014) argue that something is missing, as sustainability is still not a social norm. People in western societies know that they would be bet-

ter off if they protected their common environment – but they are stuck in a social dilemma (Ostrom 1999; Kamenica 2012). Because of this deadlock the importance of insights into social aspects of transformative processes towards sustainability is increasingly recognized (Sovacool et al. 2015). Gosling and Williams (2010) see peoples' individual relationship with nature as relevant to sustainability efforts and policies. Along these lines, we want to contribute to an intellectual discourse about human-nature relationships and support initiatives that aim to stimulate a long-lasting transition towards rebalancing the relationship of humans and nature.

According to Flint et al. (2013) conceptualizations of relationships humans have with nature are found in philosophical as well as social science literature. These multi-disciplinary discourses revolve around the same notion of human and nature relationship. Yet so far, common understanding or consensus on a common typology has proved elusive (Kellert et al. 1993; Schultz et al. 2004; Fischer and Young 2007; van den Born 2008; Bauer et al. 2009; de Groot and de Groot 2009; Buijs 2009; Teel and Manfredi 2010; Flint et al. 2013). We highlight this conceptual lack of clarity as the first of three knowledge gaps guiding this article. In addition to that, scholarship is ambiguous as to how to assess HNRs empirically (second knowledge gap). We address these knowledge gaps with two research questions: (1) *Which different types of HNR concepts can be identified?* and (2) *What are adequate scales to assess them?* Based on an analysis of existing terminologies (Flint et al. 2013), we attempt to expand the already operationalized HaN scale of de Groot and van den Born (2007) and develop a HNR scale that is (a) applicable in different contexts; (b) appropriate for both qualitative and quantitative research; (c) suitable for individual as well as group discussions and measurement; and (d) useful in both empirical and participatory processes.

Furthermore, attention is drawn to a potential link between HNR and behaviour. It is plausible and assumed theoretically that the relationship people have with nature might play a

decisive role in how people behave environmentally, however, the empirical evidence is missing. We address this third knowledge gap with the third research question: *What correlations exist between individuals' understanding of their relationship with nature and their environmental behaviour?* With our focus on environmental behaviour (Kollmuss and Agyeman 2002; Evans et al. 2013; van der Werff et al. 2013; Steg et al. 2014), we opt for a broader perspective on the natural environment that goes beyond nature and conservation behaviour (Gosling and Williams 2010), and focus on environmental behaviour in the private sphere (see section 2.1).

We do not seek to assess the explanatory role of HNR in determining environmental behaviour; particularly as predicting or even understanding individuals' behaviour holistically is difficult, if not impossible. Rather, we explore potential correlations between HNR and environmental behaviour. To validate our results, we compare these correlations with empirical results guided by Schwartz's Theory, which has been broadly applied to investigate human behaviour (Schwartz 1992; Bardi and Schwartz 2003; Evans et al. 2013; Jonsson and Nilsson 2014).

2 The Complexity of Environmental Behaviour

As Eidelson (1997) extensively discussed, social and behavioural scholars often fail to embed their research in a systemic perspective, neglecting that randomness and determinism coexist in human behaviour and social systems. Therefore, this section starts by elucidating the term "environmental behaviour". Then, based on dominant socio-psychological theories that tackle human behaviour, we build a comprehensive environmental behaviour model to address the three research questions.

2.1 *Environmental behaviour*

Following the approach of Biel and Thøgersen (2007) as well as Klöckner (2013) in our conceptual framework, we define environmental behaviour neutrally as any behaviour that has a direct or indirect, positive or negative impact on natural environments. Other definitions are more normative in the sense of how one should behave, such as ‘environmentally significant behaviour’ (Gatersleben et al. 2002; Stern 2005; Biga 2006; Dietz 2014), or ‘environmentally responsible behaviour’ (Thøgersen 2006).

For the purpose of our empirical investigation we focus on a subset of environmental behaviour, namely environmental behaviour in the private sphere to intentionally minimize the negative impact on the natural environment, which we refer to as “pro-environmental behaviour” (Kollmuss and Agyeman 2002; Evans et al. 2013; van der Werff et al. 2013; Steg et al. 2014). We specifically investigated behaviour related to consumption, mobility, energy and other daily routines for the following reasons: First, private-sphere behaviour has direct environmental consequences (Stern 2000). Second, buying organic products, using public transport, saving energy, or reducing waste are typically considered as ‘appropriate’ behaviour (Steg et al. 2014: 105). Third, these categories can be associated with tangible, everyday practices (Doyle 2013).

2.2 *Socio-psychological theories and models explaining (environmental) behaviour*

Socio-psychological disciplines consider variables such as values (Schwartz 1992; Teel and Manfredi 2010; Steg et al. 2014), worldviews (Hedlund-de Witt 2012; Liu and Lin 2014), beliefs (de Groot and Steg 2008; Gadenne et al. 2011), attitudes (Teel and Manfredi 2010; Heyl et al. 2014) or norms (Thøgersen 2006; Onwezen et al. 2013) to enlighten the complexity of environmental behaviour (Hondo and Baba 2010).

Following Ajzens’ Theory of Planned Behaviour (TPB) (1991), human behaviour is a consequence of the intention to perform it, whereby the behavioural intention depends on a

person's attitude towards performing the behaviour and subjective norms. Ajzen's linear model includes measuring a person's perceived behavioural control to determine the impact of external conditions on decision making and the extent to which the individual perceives his/her behaviour to be under his/her personal control (Claudy and O'Driscoll 2008). A different approach, the Value-Belief-Norm (VBN) of Stern et al. (1999), starts from the relatively stable Norm-Activation Model (Schwartz 1992) and explains the causal chain of beliefs about the biophysical environment (e.g. environmental worldviews) towards environmental behaviour (Aguilar-Luzón et al. 2012).

The New Environmental Paradigm (NEP) scale links environmental concern with attitudes and beliefs toward more specific environmental issues (Dunlap et al. 2000). The NEP is criticised as sort of "folk" ecological theory (e.g. Stern et al. 1999: 85), as it primarily measures broad beliefs about nature and the consequences of human action. It emphasizes polarization between ecocentric and anthropocentric orientations, missing an opportunity to consider the interplay between different dimensions of the relationship humans have with nature as identified by Flint et al. (2013).

2.3 *Values and worldviews*

General values are abstract principles that people strive for in their life, and are therefore the foundation of inner psychological processes (Mosler 2004). Schwartz (2012) illustrates that people with collective or self-transcendent values (e.g. universalism and benevolence), are more likely to show altruistic, cooperative or environmental behaviour, than people with self-enhancement values (e.g. power, achievement and hedonism). Schwartz's value scale has been supplemented by biospheric values, in order to measure intrinsic values of nature (Dietz et al. 2005; de Groot and Steg 2008; Howell 2013; van der Werff et al. 2013). Studies using this scale reveal positive correlations between altruistic and biospheric values as both can be identified as self-transcendence values (de Groot et al. 2012).

While one line of socio-psychological discourse perceives humans as guided by an integrated system of values, others describe general worldviews as explanatory variable of behaviour (Hedlund-de Witt 2012). Worldviews are understood as an overarching system that substantially informs how humans interpret, enact, and co-create reality (Poortinga et al. 2004; Hedlund-de Witt et al. 2014). Because of its broadness, the concept of worldviews is often used as an umbrella term referring to the interaction of values, beliefs, and traditions (Hedlund-de Witt et al. 2014). Similar to values, scholars distinguish between general and specific worldviews, such as environmental worldviews. According to Liu and Lin (2014), environmental worldviews describe how individuals see the natural world and how mankind is integrated or separated from it.

Crompton (2010) shows that frames of communication, campaigning, or policies can activate values or worldviews. However, scholars debate whether values or worldviews are more stable or dynamically changing. We see both as part of an integrated and dynamic system, where activating one particular value or worldview affects the other (Karp 1996; Snelgar 2006; Crompton 2010; Steg et al. 2011; Bolderdijk et al. 2013; Hurst et al. 2013).

2.4 An attempt to position HNR in a comprehensive behaviour model

To operationalize our three research questions, we synthesize the aforementioned major socio-psychological theories in a comprehensive behaviour model (see dotted rectangle in Figure 1). Via norms, we connect the Theory of Planned Behaviour (TPB) with the Value-Belief-Norm Model (VBN). Both models suggest linearity and internal, sequential triggering of psychological patterns. However, when people interact with each other as well as with the ecological system and have associated experiences, their values, worldviews, beliefs, feelings, thoughts, and actions towards the environment may change (Mosler 2004).

We add HNR as a complementary, parallel dimension in our model. HNR is an umbrella construct somewhere in between the bundle of abstract worldviews, values, beliefs,

attitudes, and perceived norms of how humans should interact with nature, and ultimately how they should behave. In principle, HNR is a view “[...] people hold about their appropriate relation with nature” (van den Born 2008: 87). Some dialogues about HNR are rooted in traditional religious or philosophical belief systems; others are based on more recent ecological concepts of socio-psychological disciplines. Despite the seemingly clearly defined HNR types in literature, we assumed HNRs to be context specific, dynamic across time and space, and not mutually exclusive (Flint et al. 2013; Raymond et al. 2013). Therefore, we limit our attempt to integrate HNR by considering it as a complementary overarching domain (see Figure 1).

3 A Methodological Approach for Operationalizing HNR

The following section describes the mixed-method approach applied to operationalize HNR and to test potential links with environmental behaviour and the Schwartz’s Theory of Basic Values. It was not a linear, but rather an adaptive process, with initial inquiries, interim results, new arising questions, and emerging conclusions, in order to gradually improve the HNR typology and scale (see Figure 2).

3.1 Scale development and empirical research

We developed and refined the HNR typology and a scale to assess it in three subsequent studies (see Figure 2). We started with a comprehensive literature review on existing HNR typologies and scales and tested these typologies and different versions of the scale empirically, combining qualitative and quantitative research methods (study 1 & 2). Each study included additional literature review and reflective discussion to identify the next research steps.

Qualitative interviews served to explore the relevance of the HNR idea and the range of variations in HNR types. Related reactions of the interviewees helped to inform a more sys-

tematic battery of items for an HNR scale. Interviews were conducted with farmers navigating changes in water quality practice and policy in the US and actors involved in sustainability oriented water management in Austria. The focus was on how stakeholders perceive their own or others' HNR, influences on environmental practices, and any potential strengths or limitations the concept might have to improve participatory processes. Interviewees were also asked whether particular frameworks (legal, institutional, organizational) shape their relationship with nature, and if HNR concepts could be of practical relevance for their work. We analysed the transcripts of qualitative interviews in a qualitative content analysis (Mayring 2000) to enhance understanding of the data and corresponding theories (Elo and Kyngäs 2008).

Based on the types and their characteristics defined in literature (Flint et al. 2013 and Table 1) and the adaptation according to the process described above, we ended up with a list of individual statements and a set of seven narratives to portray each type's characteristics. Interviewed stakeholders indicated that narratives provide a more holistic story line, which could be helpful in qualitative, participatory endeavours (see 4.1 and Table 2). Therefore in study 3, which is the basis for the quantitative analyses presented in the article, both the scales and narratives were tested among students from introductory classes from diverse majors at University of Natural Resources and Life Sciences (Vienna, Austria)¹ and Utah State University (Logan, Utah)². We selected the two student groups based on the composition of the research team as well as on the intention to include perspectives across the western world. Although a student sample is not well representing the general population, it allowed us to continuously re-test the scale in a relative homogeneous setting.

¹ BOKU – University of Natural Resources and Life Sciences, Vienna (students from the Bachelor program “Environment and Bio-Resources Management”, and “Landscape Architecture and Landscape Planning”)

² USU – Utah State University (Students in Introduction to Sociology – a general education course)

3.2 *The questionnaire*

The questionnaire for the third study (focus of this paper) consisted of 5 modules (module 2-5 with a five-point Likert scale). The statistical analysis included statistical relationships using difference of means test, descriptive statistics, and Spearman Rho correlations.

Demographics: We collected basic information about participants' background, such as age, gender, study major, and the setting of their childhood.

Environmental Behaviour: We adopted available items from studies on environmental behaviour in the private sphere (Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management 2014; Statistik Austria 2009; Heyl et al. 2014). Respondents indicated their own behaviour regarding consumption, mobility, energy savings and others such as reducing waste on a scale ranging from "never" to "always". Being aware of possible biases due to the desire to exhibit internal consistency between values, HNR and behaviour, we situated the behaviour module prior to the HNR and value modules.

HNR narratives: Respondents were asked to judge to which extent each of the seven HNR narratives applies to them, using a scale from "does not apply" to "fully applies".

Values: We adopted items from the shortened 'Portrait Values Questionnaire (PVQ)' (Schwartz et al. 2012) as it was found to support assessing respondents' values more indirectly (Fotopoulos et al. 2011). The PVQ consists of short verbal portraits of different people, each describing goals, expectations and wishes of a person that implicitly point to the importance of a single value type (Schmidt et al. 2007; Fotopoulos et al. 2011; Beierlein et al. 2012). Respondents were requested to compare the portrait (item) to them and mark their reflection on the scale from "not like me" to "very much like me". As the PVQ uses the 3rd person to allow asking (indirectly) for a judgment about others we converted the HNR items to the 3rd person as well.

HNR single statements: We again assessed respondents' HNR, but this time by separating the single statements of the narratives and arranging them in mixed order. The aim of this separation was to test whether HNR can be assessed by narratives as well as by single statements. Respondents were again asked to judge to which extent each of the 26 statements applies to them, using a scale from “does not apply” to “fully applies”.

4 Results

This section presents outcomes of the HNR scale development and summarizes the main results of the quantitative student surveys (study 3). Results from qualitative interviews (study 1, see Figure 2) underpin the results in our discussion. The sample size presented in this paper was 402 (45% BOKU, 55% USU). The average age of the respondents was 21 (38% male, 62% female).

4.1 HNR typology and scale development

As basis of the investigations we screened numerous journal articles and book chapters and synthesized empirically grounded typologies of HNR, in particular the HaN Scale of de Groot and van den Born (2007) and the philosophical discourses of Zweers (2000). The most frequently used HNR typologies emphasize the following types: ‘Master’, ‘Steward’, ‘Partner’, and ‘Participant’ (Zweers 2000; de Groot and van den Born 2003; de Groot and van den Born 2007). In the course of our three studies, we expanded the typology as we saw three types missing (Table 2).

First, we included a type that represents the dominant contemporary discourse in resource management – the Ecosystem Services (ES) concept. While initiated by people with conservationist goals, it was directly intended to motivate action by tapping into utilitarian motives and the notion of people using nature or benefitting from a well-functioning nature (Flint et al. 2013; Raymond et al. 2013). The ES literature is contradictory and often linked to

the societal level, while HNRs are mostly conceptualized at the individual level (Flint et al. 2013). Therefore, we integrated elements of the ES concept as a separate HNR type and labeled it as ‘User’. We followed Flint et al. (2013: 214) who found that “[...] the predominant articulation of ES fits in the nexus of anthropocentrism, utilitarianism, and notions of nature as separate from humans”.

Second, we incorporated the notion of ‘Apathy’ with regard to nature. Apathy suggests that a relationship with nature may not at all be important or recognized by people. Thompson and Barton (1994), Bauer et al. (2009) and Chan et al. (2012) report the existence of this HNR type.

Finally, we also introduced the ‘Nature Distant Guardian’, who sympathizes with nature – yet with less direct engagement. We observed in our qualitative interviews that people living in cities sometimes felt less directly connected with nature, whether intentionally or not. Similarly Bauer et al. (2009: 2914) identified the “nature sympathizers” as a type that is environmentally less concerned or less active with regards to nature, but still shows biophilia attitudes towards nature.

Reflecting on the wording turned out to be the most crucial part of developing the HNR scale. During the qualitative interviews, the initial wording of the narratives, in particular those for Master and Participant was perceived as “black-and-white thinking” and too normative. We identified narratives with interconnected, inconsistent or strong normative statements that interviewees struggled with. We subsequently increased consistency and excluded particularly positive and negative connotations.

4.2 *HNR types among students*

As Figure 3 illustrates, students in Austria (BOKU) and Utah (USU) associated themselves with HNR types of Steward, Partner, Participant, and User and less with types of Apathy, Master and Nature Distant Guardian. No Austrian student and only 6.4% of the US re-

spondents indicated that an apathy relationship with nature ‘applies’ or ‘fully applies’ to his/her relationship with nature.

However, Figure 4 shows respondents indicating 5 on the 5 point Likert Scale on each of the HNR types; the respective line indicates the average score on the other types. This is a key finding of our research as it shows (1) that people hold multiple HNRs and (2) that people identify with all HNR types apart from Apathy and Master. Respondents identifying with statements of the Master rarely found themselves in agreement with statements from other HNR types. However, respondents agreeing with Apathy identified to some degree with Partner and Participant oriented statements.

We also tested the trade-offs between assessing HNR by narratives or single statements. The Cronbach’s alpha for reliability for most single statements was high ($> .6$), considering the small number of items per group (de Groot 2012: 6). Reliability scores were somewhat lower for User (.43), Master (.52) and Nature Distant Guardian (.55). However, we found significant enhancements of the alpha scores when the fourth item of User (.55) and the third item of Master were excluded (.56). The factor analysis showed that single statements did not always perfectly load into the associated narratives. Whereas master, apathy, nature distant guardian and user seem to be well described, the factor analysis of our sample showed overlaps between the descriptions of guardian, partner and participant.

4.3 Correlations of HNR with environmental behaviour and values

We calculated Spearman Rho correlations between HNR narratives and environmental behaviour and between values and environmental behaviour to assess whether both scales (HNR, values) reveal similar links with environmental behaviour and whether specific relationships towards nature correlate with specific values.

Table 3 lists correlations between items of HNR and environmental behaviour with significance levels of $p < .001$ (***), $p < .01$ (**) or $p < .05$ (*). Three items are control variables

and have to be interpreted inversely. Basically, the HNR types of Apathy, Nature Distant Guardian and Master correlate negatively with pro-environmental behaviour (see section 2.1), whereas User, Steward, Partner and Participant show positive correlations. Students with an apathetic relationship towards nature were least likely to indicate pro-environmental behaviour. We found the highest significant positive correlations with pro-environmental behaviour – particularly regarding food and energy – for the Steward and Participant types.

Correlations between values and pro-environmental behaviour were less strong, yet values of self-direction, universalism and benevolence correlated positively with pro-environmental behaviour. A tendency towards negative correlations was found for values of conformity, tradition, security, power and achievement.

Our data indicate that HNR and values are remarkably compatible (see Table 4). HNR types of Apathy, Nature Distant Guardian and Master correlated positively with significance levels of $p < .001$ (***) , $p < .01$ (**) or $p < .05$ (*) with values of security (seeking for safety, harmony, and stability of society), power (enjoying prestige and control or dominance over people and resources), tradition (preserving the world order as it is) and conformity (restrain of actions, agree with laws and norms). In contrast, the HNR types User, Steward, Partner, and Participant correlated positively with values of self-direction (enjoying independent thought and action), universalism (supporting welfare of all people and for nature) and benevolence (seeking to enhance and provide general welfare to others).

5 Discussion

In this section we focus on those results that contribute to the three knowledge gaps identified in the introduction.

5.1 *HNR types identified with narratives and single statements among students*

We identified similar distributions of HNR types as described in literature. Not many respondents in our quantitative assessment ascribed to the concepts of Apathy and Master (Figure 3). As found previously in qualitative interviews, interviewees did not identify with the Master, but when asked to reflect about society in general, they often indicated they view the Master as a dominant relationship people have with nature. Some interviewees indicated that the rare identification with the Master might be the result of socially desirable response pattern and a certain embarrassment of being categorized as one of these ‘negative’ types. This, however, is in line with the definition of HNR we presented in section 2.2: HNR is a view “[...] people hold about their appropriate relation with nature” (van den Born 2008: 87). Similarly, interviewees from water management stated that they are longing for the immaterial world, while living in a very material world. Therefore, they did not identify with Apathy and Nature Distant Guardian. Similarly, Bauer et al. (2009: 2918) found the rejection of “nature sympathizers” (similar to our Nature Distant Guardian) and Apathy.

The discrepancy between people’s desired relationship with nature and their practiced behaviour was discovered in other studies as well (de Groot and van den Born 2003; de Groot and de Groot 2009; de Groot et al. 2011). Zheng and Yoshino (2003) explain the increasing rejection of the Master in a longitudinal study of Japanese’s attitudes to nature over the last 50 years as a consequence of a growing environmental awareness in industrialized societies. Their research in countries with high economic development and a number of environmental accidents shows how a superior relationship towards nature decreased over the past half century. This could be due to the fact that a higher level of economic development comes along with an increased demand for environmental quality (Zheng and Yoshino 2003). Other scholars, however, see the Master well represented in western or industrialized societies (Schroeder 2007; van den Born 2007).

The results further support conclusions of Teel and Manfredi (2010) that HNRs are not mutually exclusive. As Figure 4 shows, HNRs in our sample are interconnected; students hold multiple relationships towards nature respondents. Those who identified with the Master for instance also identified with statements of the User, Steward and Partner. Putting individuals in one specific category is not possible, but also not the aim of exploring HNR.

One of our goals was to test if more holistic narratives can substitute for a long list of single HNR-statements. But the Cronbach's alpha identified some inconsistencies among statements of some HNR types. These critical items need further revision or might be excluded to increase reliability of the scale. However, this points at the risks associated with narratives, such as inconsistent HNR components combined to types that do not reflect the respective context. For an accurate measurement of HNR in quantitative analyses, single statements provide more detailed information, and should therefore be the preferable option. On the other hand, in study situations with pre-existing reflection on HNR, narratives can be useful for participatory research, education, and management processes (e.g., role play games, focus groups).

5.2 The connection between HNR and Environmental Behaviour

Following Kellert et al. (1993) and Tidball (2012) we identified correlations between psychological concepts related to nature and environmental behaviour. The HNR types of Apathy, Nature Distant Guardian and Master were found in this study to correlate negatively with pro-environmental behaviour, whereas Steward, Partner and Participant correlate positively. This shows the linkage between the respondent's affiliation to these types and their environmental behaviour. Correlations with pro-environmental behaviour were rather ambiguous and weak for the User, which we framed to mirror the ES concept with utilitarian notions of a well-functioning nature providing benefits to humans. According to Fairhead et al. (2012) and Raymond et al. (2013) the ES approach could even promote an exploitative

relationship with nature and consequently contradict other HNRs. This concern is particularly relevant, as at the EU level the ES concept is integrated in the management of natural resources (e.g. in the Biodiversity strategy).

The results reveal stronger correlations of the HNR scale with pro-environmental behaviour than with Schwartz's value scale. Still, we found some positive correlations with pro-environmental behaviour for values such as self-direction, universalism and benevolence, and negative correlations for values of conformity, tradition, security, power and achievement. These findings are very much in line with Schwartz (2012) and others (e.g. Karp 1996; Nordlund and Garvill 2002; Steg et al. 2011; Jonsson and Nilsson 2014; Hurst et al. 2013). We do not conclude that the HNR scale is better linked to environmental behaviour, but we perceive HNR as possibly thematically closer to environmental behaviour than values. Values are more general and thus supportive in exploring general human behaviour (de Groot et al. 2012; van der Werff et al. 2013). Schwartz's Theory of Basic Values does not clearly distinguish between altruistic and biospheric value orientations (de Groot and Steg 2008). But, as this study shows, HNR and values are interconnected. Therefore we believe that HNR may contribute to a better understanding of the complexity of environmental behaviour.

As people seem to hold multiple HNRs simultaneously, addressing the relationship humans have with nature might be a supportive approach for governance strategies. This is particularly relevant as we found HNRs correlating with behaviour as well as underlying values. Therefore, the HNR approach might have its strengths, as changing values in the short-term is challenging (Crompton 2010; Chilton et al. 2012; Bolderdijk et al. 2013; Hurst et al. 2013; Price et al. 2014). In addition, interviewees emphasized that including HNR in communication and awareness raising projects may support reflections and discussion on peoples' relationship with nature. According to Liu and Lin (2015) this is crucial for change to happen. Stakeholders of participatory processes in water management see the HNR approach for ex-

ample as a potential auxiliary means to improve mutual understanding and consolidating different interests.

6 Conclusion and Further Research Needs

In this article we addressed conceptual uncertainties related to a typology of human-nature relationships (1st knowledge gap), uncertainties how to assess them (2nd knowledge gap), and finally explored if human-nature relationships are linked with environmental behaviour (3rd knowledge gap). The results for the narratives and single statements show that both approaches are suitable to empirically identify HNR. Furthermore, the series of studies indicate that the HNR scale is applicable in both qualitative and quantitative research.

Promising as the results are, the present study has its limitations. First, the terminology was particular challenging as we were working in both English and German languages. Relatedly, framing a scale that is general enough to support surveys in different contexts limited flexibility in wording. Second, the sample of the quantitative survey was a homogenous student group. While this ensured feasibility, relative homogeneity, and allowed us to continuously re-test the scale, further research needs to test the applicability of the HNR scale and its link with nature conservation behaviour, environmental behaviour in other contexts, and beyond student populations. When using our scale in future surveys we encourage scholars to identify single statements that might need context-specific adaptation. Furthermore, the overlapping of certain HNR types could confirm the assumption that HNR are not mutually exclusive, but could also indicate scope for statistical dimension reduction.

To conclude, the HNR typology highlighted in this paper was derived and tested in an iterative process of literature review and exploratory research. The respondents and interviewees widely negated a dominative relationship towards nature. HNRs are not mutually exclusive and it seems that geographical contexts and student majors or interests have minor effects on the relationship students have with nature. Particularly promising for further re-

search is the clear interconnection between the relationship humans have with nature and their environmental behaviour. As HNRs might be more dynamic than values and more clearly linked with environmental behaviour, we might benefit from future research on how to activate or strengthen HNRs by governance strategies and communication framing. If we understand this, we might be better able to rebalance the relationship of humans with nature.

7 References

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8 Tables

Table 1
HNR dimensions (Flint et al. 2013: 210)

DIMENSIONS	CHARACTERISTICS
Positionality dimensions	Anthropocentric/ecocentric Humans/nature above Humans part of/separate from nature
Character of bond dimensions	Intention of action Biophilia/biophobia Responsibility/rights Role of technology Spirituality Instrumental/intrinsic Connectedness/apathy
Understanding of nature dimensions	Mode of learning Fragility/resilience Predictability of nature

Table 2
Narratives portraying each HNR type's characteristics

HNR TYPE	HNR NARRATIVE (SCALE)
Master	They think they have the right to alter nature. Technological progress enables them to tame and improve upon nature. They believe they have the right and obligation to protect themselves from natural threats.
Steward	They think their actions may have an impact on nature. They feel responsible to protect nature. They think that mankind can be a threat to nature. They would like technological interventions to be regulated to minimize negative effects on nature.
Partner	Nature is important and enjoyable for them. They try to understand natural processes to reflect on their influence on nature. According to them technological interventions are allowed only in case both humans and nature benefit. In their opinion humans and nature are of equal value.
Participant	They feel as part of nature. The physical and emotional bond between self and nature is important for them. They think that too few humans recognize the power, value and beauty of nature. According to them they do not have the right to use technology to alter nature.
User	They perceive nature as a provider for products and services. In their opinion natural processes enhance economic welfare. They think they have the right to use nature and to enhance natural service provision with technology. They feel responsible to protect nature for today's and future generation's welfare.
Apathy	In their daily life nature does not play a role. They think they are not dependent on nature to survive. In their opinion their behaviour does not have an impact on nature. They think that engagement for nature should not be given too much weight.

Nature Pets, houseplants or urban gardening may substitute their direct experience in nature.
Distant Exclusive engagement in nature protection through media is enough for them to connect
Guardian with nature. An environmentally oriented lifestyle may help them to become part of nature without having to leave the city.

Table 3Positive (**bold**) and negative (*italic*) correlations between HNR narratives and statements on environmental behaviour (n=402)

STATEMENTS ON ENVIRONMENTAL BEHAVIOURS		HNR NARRATIVE (correlation coefficient)						
		Master	Steward	Partner	Participant	User	Apathy	NDG
	I buy organic/environmentally friendly products.	<i>-.166</i> **	.339 ***	.259 ***	.229 ***	.035	<i>-.320</i> ***	<i>-.117</i> *
FOOD	I buy regional and seasonal food.	-.009	.224 ***	.185 ***	.241 ***	.166 **	-.071	.016
	I eat vegetarian or vegan food.	<i>-.142</i> **	.249 ***	.180 ***	.258 ***	-.045	<i>-.185</i> ***	-.041
	I try to diminish packaging when buying products.	<i>-.107</i> *	.242 ***	.269 ***	.216 ***	.013	<i>-.223</i> ***	-.044
MOBILITY	° To reach my holiday destination I take the airplane.	.054	.147 **	.031	-.028	.026	-.002	.128 *
	° I take a car for my free time activities.	.072	<i>-.379</i> ***	<i>-.168</i> **	<i>-.148</i> **	-.074	.334 ***	.082
	I go to university by foot, bike or public transport.	-.073	.293 ***	.164 **	.038	.099 *	<i>-.265</i> ***	<i>-.163</i> **
ENERGY	I turn the lights off when leaving the room.	-.05	.227 ***	.142 **	.191 ***	.098	<i>-.169</i> **	-.081
	I use energy-efficient devices.	.058	.107 *	.078	.084	.153 **	-.08	-.025
OTHERS	I try to convince my friends and acquaintances to change to a green electricity provider.	-.08	.110 *	.146 **	.200 ***	-.037	-.079	.09
	° I like to buy new clothes.	.119 *	<i>-.223</i> ***	<i>-.105</i> *	<i>-.129</i> *	-.004	.316 ***	.172 **
	I support a non-governmental organization engaged in nature protection (e.g. World Wildlife Fund).	-.085	.087	.205 ***	.179 ***	-.017	.028	.087
	I sort my garbage to separate it from recyclable material before discarding it.	<i>-.106</i> *	.237 ***	.197 ***	.131 **	.142 **	<i>-.271</i> ***	-.053

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

... inverse defined variables

Table 4Positive (**bold**) and negative (*italic*) correlations between HNR narratives and Schwartz values (aggregated mean values) (n=402)

VALUES	HNR NARRATIVES (correlation coefficient)						
	Master	Steward	Partner	Participant	User	Apathy	Nature Distant Guardian
Self-direction	.017	.176^{***}	.105[*]	.157^{**}	.120[*]	<i>-.106[*]</i>	.055
Universalism	-.099	.420^{***}	.349^{***}	.292^{***}	.129[*]	<i>-.253^{***}</i>	-.069
Benevolence	.019	.104[*]	.147^{**}	.106[*]	.101[*]	-.042	.048
Conformity	.220^{***}	<i>-.230^{***}</i>	<i>-.131^{**}</i>	-.065	.032	.347^{***}	.096
Tradition	.054	<i>-.197^{***}</i>	<i>-.109[*]</i>	<i>-.101[*]</i>	-.034	.240^{***}	.06
Security	.193^{***}	-.068	-.017	-.005	.098	.188^{***}	.227^{***}
Power	.228^{***}	<i>-.152^{**}</i>	-.098	-.079	.09	.284^{***}	.121[*]
Achievement	.113[*]	.001	-.009	.015	.094	.085	.186^{***}
Hedonism	-.034	.152^{**}	.029	.075	.007	-.066	.117[*]
Stimulation	.035	.096	.104[*]	.150^{**}	-.007	.063	.107[*]

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

9 Figures

Figure 1

Comprehensive Model of existing socio-psychological theories with embedded HNR theory (RQ1, RQ2 and RQ3 illustrate the three research questions, VBN...Value-Belief-Norm, TPB...Theory of Planned Behaviour)

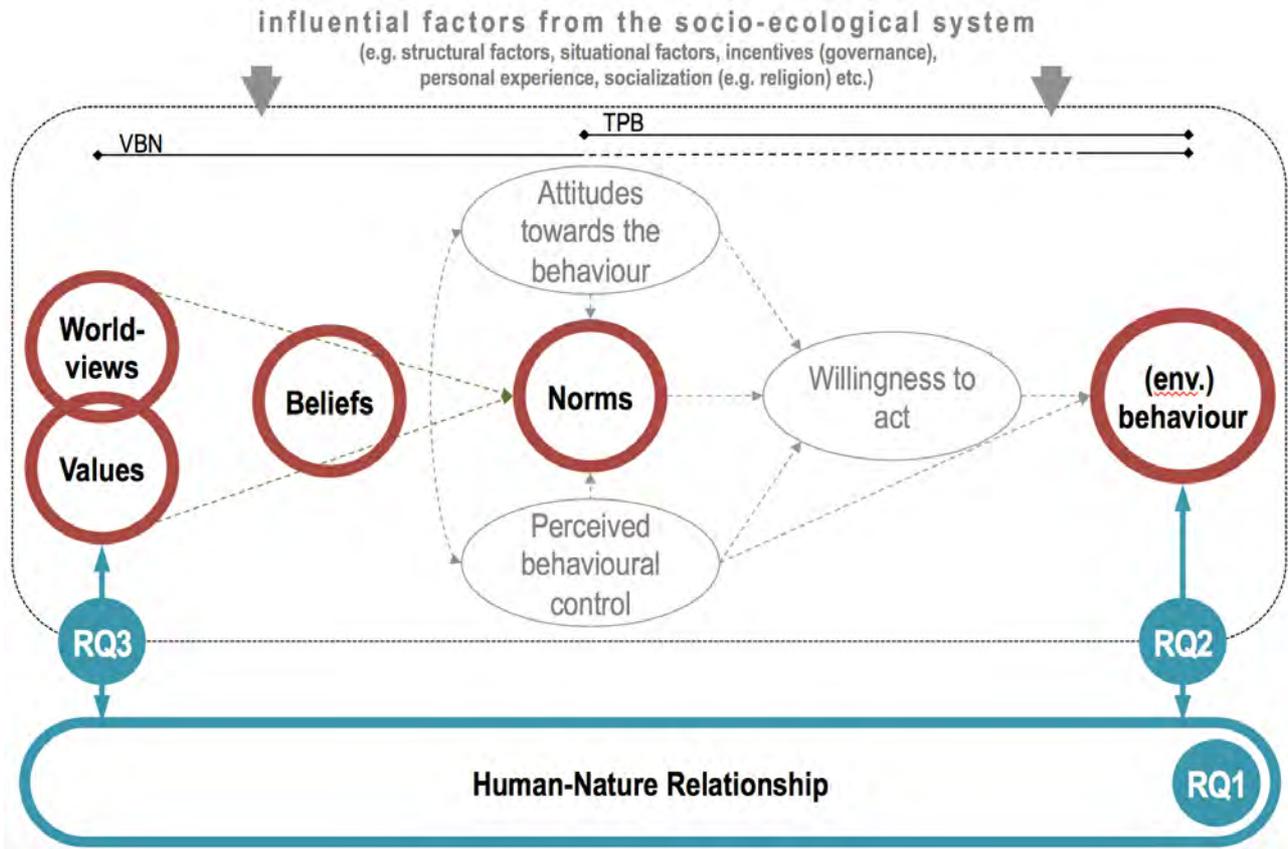


Figure 2

Overview of the HNR scale development process preceding study 3 that is presented in this article (PVQ...Portrait Value Questionnaire (Schwartz et al. 2012))

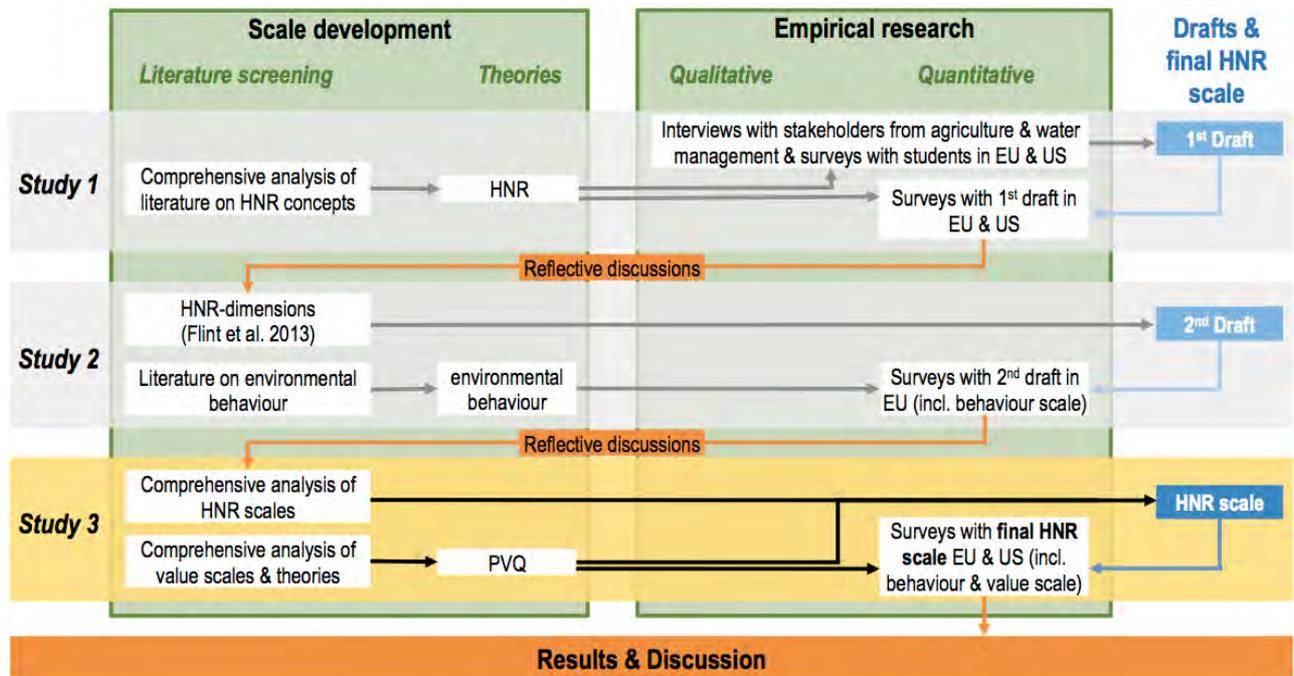


Figure 3

Distribution of HNR types among students (Austria/EU, BOKU: n = 182, Utah/US, USU: n = 220)

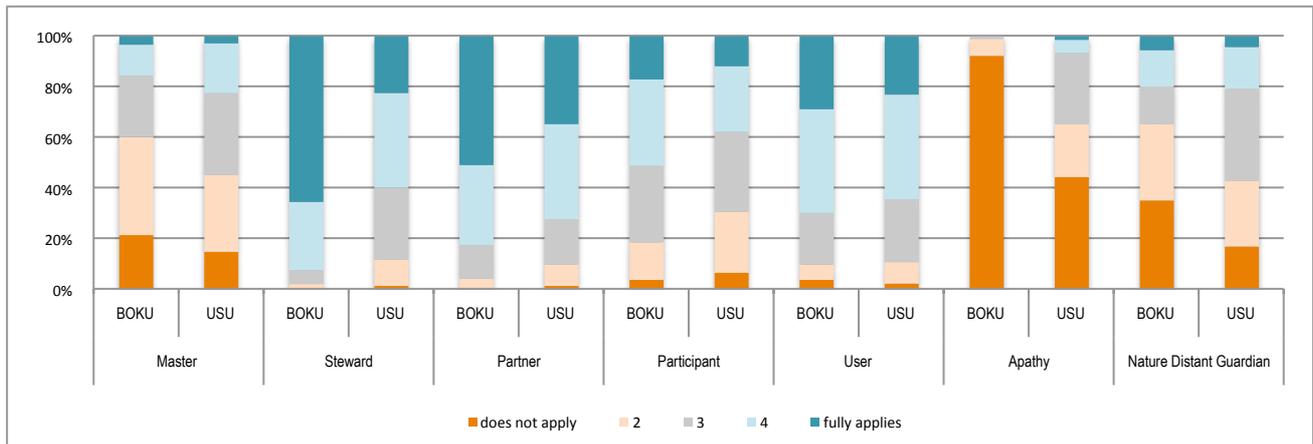


Figure 4

Respondents hold multiple HNRs. Each line belongs to respondents' who strongly identify themselves with a certain type (=5). The circles mark the respective HNR type that the dotted lines represent (arithmetic means, Master n=12; Steward n=167; Partner n=166; Participant n=56; User n=101; Apathy n=3; NDG n=19; Total n=402)

