

No Measure without Concept. A Critical Review on the Conceptualization and Measurement of Environmental Concern

André SCHAFFRIN*

University of Cologne

Abstract: Environmental concern is a highly relevant concept in the context of environmental change and increasing demand for political regulation of environmental protection. In order to prevent climate change, loss in global biodiversity or other highly critical environmental issues, we need to understand why (and why not) citizens support environmental politics. However, there is no measure without a concept, and empirical results might be biased if they are not operationalized according to well defined (theoretical and methodological) criteria. This research endeavor focuses on historical and more recent developments of the concept of individual environmental concern. It will be demonstrated that environmental concern is not only a distinct concept excluding behavior and knowledge, but is also rather complex addressing geographical as well as temporal issues. Most recent developments suggesting a hierarchical multi-dimensional character will be discussed and examples of the most relevant empirical measures and scales will be evaluated.

Keywords: *environmental concern, climate change, measurement construction.*

'(...) environmental concern is a broad concept that refers to a wide range of phenomena – from awareness of environmental problems to support for environmental protection – that reflect attitudes, related cognitions, and behavioral intentions towards the environment'
(Dunlap and Jones, 2002: 484-485).

Introduction

During the last decades, environmental protection became an urgent and relevant topic in public and political

debates. Global warming, the depletion of natural resources, habitats, and the overall biodiversity are issues that are subject to international agreements and negotiations but are also highly

*e-mail: schaffrin@wiso.uni-koeln.de. André Schaffrin is Doctoral Candidate in the Research Training Group 'Social Order and Life-Chances' (SOCLIFE) at University of Cologne (Germany). He holds a Masters degree in Social Science from Mannheim University (Germany) and studied Sociology at Flinders University (Australia).

discussed by domestic political elites in Western Europe. Driven by environmental movements on the global and local scale as well as the electoral success of green parties throughout European parliaments, national governments now have the task to set up extensive policy programs and regulation in order to meet ambitious international agreements such as the Kyoto Protocol and EU environmental directives (e.g. the EU Climate and Energy Package). Since electoral support is one of the central influence factors of policy making in democracies (Burstein, 2003), environmental concern of the general public plays an important role in supporting the government to foster environmental policies, and are, therefore, of major interest for social research (Marquart-Pyatt, 2007). In order to understand recent developments in public support for environmental politics on the domestic and the international level, we have to investigate whether and how individuals think, feel, and act on issues which are related to the environment. Following this line of argument, it seems crucial to understand the character and diversity of individual environmental concern in a first step before we can analyze its impact on political decision making in the second step. Thus, to provide 1) a general concept and 2) reliable measurement instruments of environmental concern is of major importance for research on the individual-nature relationship and will be subject of this research article.

1) Until the 1960s, scholars from different social science disciplines conceptualized and operationalized environmental concern rather diverse. This variety of concepts is often

misleading. In order to provide a research basis on individual environmental concern, it is crucial to discuss a more general concept which combines similarities and differences in environmental research across social science disciplines.

Another issue is the changing character of the object we are concerned about: the environment as a basic element of human being in the temporal and geographical dimension. Thus, the environment itself is a rather complex construct. It can be global but also local in character reflecting specific problems of short-term nature but also long-term stable developments. It might include high numbers of actors and often has no straightforward solution. The concept of environmental concern must reflect these characteristics in order to address the full complexity of nature and the environmental problems society faces.

2) On the ground of these conceptual debates, there has also been a development in measures and scales targeting on individual environmental concern. Empirical research on environmental concern, however, only provides reliable and valid evidence if the underlying theoretical concept sufficiently addresses all possible options and characteristics of the real concept. Recent developments on measurement and scale construction integrate a range of environmental characteristics and make assumptions about underlying dimensions on individual aspects of concern, knowledge, attitudes, and values. The article will discuss several measures and evaluates the more recent development of the environmental attitudes inventory by Milfont and

Duckitt (2010).

Following this line of argument, the paper will present a distinct formulation of the concept of environmental concern. In the first section, I outline both aspects of environmental concern, the substantive issue of *environment* and the more theoretical perspective of different expressions of *concern*. The discussion will illustrate different developments and peculiarities of both aspects. At the end of this section, I will highlight different definitions and suggest a conceptualization which tries to combine all remarks. The analysis proceeds with a discussion on examples of general operationalization practices and the most relevant measures. This section will conclude with recent scale developments of Milfont and Duckitt (2010). The final section concludes with general remarks for future research developments.

Environmental Concern: The Two Concepts' Formulation

Dunlap and Jones (2002) suggested a distinction between the substantive part (environment) and the theoretical aspect (concern) of the concept of environmental concern. These two categories precisely address the two-dimensional character of the theoretical concept: the *object of concern* which is all facets of the physical or constructed environment, and the *expression of concern* which regards all aspect of feelings, attitudes, values, and norms an individual can engage with (Dunlap and Jones, 2002).

Environmental Concern for Substantive Issues: The Object of Concern

Research on environmental concern can focus on very different environmental issues which makes general conceptualization difficult (for a more detailed discussion see Dunlap & Jones, 2002). I will discuss only two basic aspects of the substantive issue of environmental concern in more detail which seem to capture the most relevant dimension for social science research: 1) the geographical and 2) the temporal dimension of the environment.

1) Comparing environmental concern across people living in very different geographical circumstances of environmental pollution is problematic (Dunlap and York, 2008). People might not have coherent beliefs about environmental issues generally but instead choose particular environmental problems that they care more about (Ignatow, 2006). Hence, scholars of environmental attitudes (Inglehart, 1995; Franzen and Meyer, 2004; Gelissen, 2007) distinguish between concern about 'objective problems' and more general 'subjective values'. On the one hand, environmental concern of an individual very much depends on its spatial background like the weather, but also geographical vulnerability from sea-level rise and natural hazards ('objective problems') (Hamilton, Colocousis and Duncan, 2010). Following Wynnveen, Kyle & Sutton (2010), it is the change in the physical settings and personal experiences combined with place identity or place dependence which affects individuals' concern for the environment. On the

other hand, Milfont, Sibley and Duckitt (2010) argue that there is more general concern for global environmental problems like climate change than for local changes because they are interpreted as more serious ('subjective values') (also called 'environmental hyperopia' in Uzzell, 2000). Following this line of argument, it is crucial to consider the spatial component in the concept of environmental concern in order to avoid bias in measurement.

2) A second important dimension is the temporal perspective of environmental issues. As Dietz, Dan and Shwom (2007) state, 'individuals vary in how much they think about the future and how far into the future they think' (ibid: 188). In general, we find a conflict between individuals' short- vs. long-term interests (Milfont and Gouveia, 2006). On the one hand, concern for the environment can be understood as a reaction towards local threats for health and economic well being. On the other hand, environment is a space for next generations and present environmental pollution will lead to negative consequences in future. Individuals who are concerned about environmental problems that harm, for example, their physical health status are not necessarily worried about the environment of their grandchildren. Consequently, protest against water pollution of local rivers is motivated quite differently than support of domestic policies for greenhouse gas emission reduction. Water pollution instantly affects individual well being whereas domestic climate policies such as taxes on carbon intensive energy production and fuels serves to prevent global warming in the long run, but affects electricity prices in short term.

Individuals focusing on short term interests would be more likely to protest for higher standards in water quality but would reject policies which are likely to increase electricity prices. Given these arguments, it is crucial to consider the time perspective in the concept of environmental concern in order to avoid bias in measurement.

In order to address both the temporal and geographical issue of the environment, research should focus on individuals' general relationship to nature protection, their specific experiences and spatial attachment but also on their time perspective in short- vs. long-term interests. Interest-based concern mostly derives from past or present experiences of the direct individual environment (Shwom, Dan and Dietz, 2008). Taking individuals' general value orientations for future generations into account and measuring their place attachment and personal experiences with the physical environment reflect a more precise measure of environmental concern.

Environmental Concern as a Theoretical Conceptualization: The Expression of Concern





Two different historical perspectives on the expression of concern can be distinguished in the literature (Dunlap and Jones, 2002). The first one comes from political science and is aiming at individual attitudes towards environmental policies (e.g. Heberlein, 1981). Applied dimensions or attributes which can be derived from this research stream is the question of causes for environmental problems, for responsibility, and individuals' suggestion and beliefs

about possible solutions. The political science approach further asks for the individuals' evaluation of seriousness of specific environmental problems and whether they would support policies or even become actively involved in environmental protection (Dunlap and Jones, 2002).

The theoretical perspective as the second historical approach with the focus on individuals' expression of concern comes from psychology and attitude theory (e.g. Ester, 1981). In general, attitudes or individual

concern is categorized along four components: a cognitive, affective, conative, and behavioral dimension. Cognitive aspects are knowledge, believes, or norms, whereas the affective dimension refers to emotive and evaluative individual stages. The conative dimension is an expression of behavior intention. Both actual behavior and behavior intention refer to policy support as well as to personal action in order to protect the environment.

Table 1. *Similarities between the policy and the theoretical approach of individual concern*

Policy approach		Theoretical approach	
Causes			
Responsibility	Cognitive		Knowledge, believe/norm
Solution			
Serriousness	Affective		Emotive Evaluative
Support (intention)	Conative (intention)		Policy support Personal action
Behavior	Behavior		Policy support Personal action

Source: Own conceptualization based on Dunlap and Jones (2002).

Both approaches are discussed by Dunlap and Jones (2002). However, I argue that they can be combined by looking at the similarities between the components of both concepts. Table 1 gives an overview of the suggested parallel interlink. Thus, individual knowledge about causes, responsibilities, and solutions are clearly cognitive aspects which include

a searching process for information as well as selective filtering into predefined cognitive categories such as believes or norms. Furthermore, asking respondents whether they think of specific environmental problems as a serious threat means asking for an evaluation of that process which might also be influenced by emotional aspects. Looking at the

rows of policy support (as a conative component) and behavior, similarities between both approaches are rather obvious. Consequently, we end up with very distinct attributes which constitute a more general definition of environmental concern.

Definition

Having discussed both sub-concepts of environmental concern, which is the environment and concern, we now develop a definition of the overall concept. One definition which includes all components discussed so far is provided by van Liere and Dunlap (1980). The authors define environmental concern as ‘perceiving environmental problems as serious, supporting efforts by government to protect environmental quality’ and as ‘engaging in behaviors aimed at improving environmental quality’ (van Liere and Dunlap, 1980: 188). Following this definition and from the discussion above, we can summarize this definition in a scheme as indicated in Figure 1 where environmental concern consists of four separate components. The cognitive component

is personal knowledge and believes about causes, responsibilities, and solutions for environmental problems. The affective component adds an emotional or evaluative part where individuals decide whether postulated consequences from environmental problems are good or bad (more or less seriousness) on the basis of their knowledge and believes (cognitive component). This evaluation activates the conative component of behavior intention which is either support for environmental policies or personal action to prevent personal harm. The final step is to transpose the intention into real action which is the fourth component of environmental concern. As indicated by the direction of the arrows in Figure 1, all components serve as measures for the overall latent construct of environmental concern but do not constitute necessary/sufficient parts of it. During the years of research, this understanding changed by focusing on single components and investigating whether they are necessary for the concept of environmental concern. Following, I will discuss two major issues concerning specific attributes of the concept.

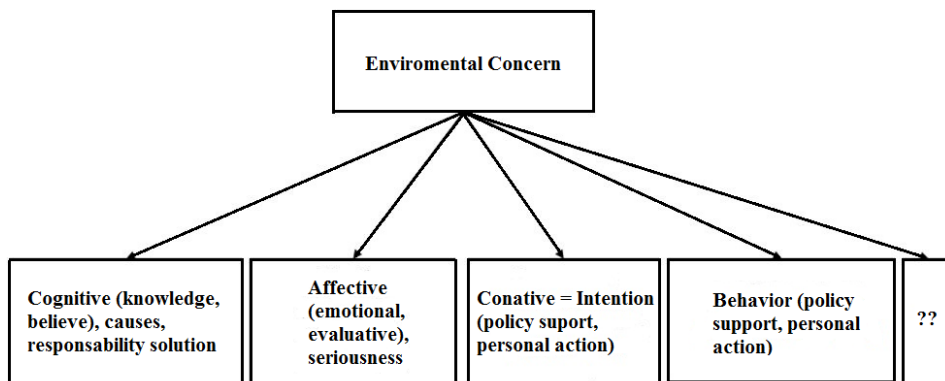


Figure 1. *The concept of environmental concern – first version*

Source: Own illustration based on van Liere and Dunlap (1980).

One important issue is the exclusion of knowledge as a cognitive attribute of the concept definition. Bord, O'Connor and Fisher (2000) state that accurate knowledge about consequences of, for example, global warming is a precondition in order to be actively engaged in the mitigation of climate change. In contrast, accurate knowledge is not necessary in order to stimulate general concern. Several studies find knowledge to be a very distinct aspect from environmental concern since it significantly explains environmental behavior, but not beliefs or attitudes (Bord, et al. 2000, Dietz et al., 2007, Milfont and Gouveia 2006). Moreover, knowledge might serve as an additional link between environmental concern and environmental behavior: someone who is very much concerned about the environment in general will be more active if the person knows what to do in order to, for example, reduce carbon emissions in the context of climate change (Fransson and Garling, 1999). We would expect that individuals with higher levels in environmental concern also search for more information on causes and consequences of climate change. In contrast, we would not expect that someone who is well informed about traffic pollution and its consequences for global warming, but who is not directly affected by negative consequences of rising temperatures, necessarily change their attitudes about driving a car. Information on both evidence for and rejections of the existence of global warming is nowadays easily accessible and highly salient in public media. Knowledge about environmental problems therefore only partly reflects environmental concern and rather

serves as an indicator for individuals' media consumption or general interest in science. This line of argument leads to the distinct conclusion that knowledge is not part of the overall concept of environmental concern.

The second important issue concerns individual behavior. Correlational measures indicate only a moderate relationship between environmental attitudes and environmental behavior which is discussed by a high number of studies (e.g. Diekmann and Preisendörfer, 1992; Franzen, 1995; Diekmann, 1996; Diekmann and Preisendörfer, 1998; Kühnel and Bamberg, 1998; Quandt and Ohr, 2004; Best, 2009). Further analyses point to the distinction between environmental behavior and behavior intention (e.g. Urban, 1986; Takács-Sánta, 2007). A very important argument for not considering behavior as an attribute of the overall concept of environmental concern is that it does not fulfill the characteristics of a general concern, but is rather a consequence. As I argued above, other factors such as knowledge or financial resources influence whether people are able to transfer their environmental concern into actual behavior. Low income households reduce energy consumption in order to save money regardless of individual concern for the environment (Keirstead, 2007; Bladh and Krantz, 2008). In the same vein, it is most likely that individual actors are highly committed to the environment but fail to act accordingly due to the lack in knowledge about adequate behavior. Consequently, individual environmental behavior is not considered as an attribute of the concept of environmental concern

whereas behavior intention can be still an existential part of it.

Clarifying on Environmental Terminology

Among the discussion about different components of the definition of environmental concern, there is also confusion about how to interpret the remaining attributes. So far, the components of the concept of environmental concern are the cognitive aspect (only beliefs), the affective, and the conative (behavioral intention). Even though this conceptualization is more precise, we still have some ambiguity and confusion about different terms which are discussed in environmental concern literature. For example, some scholars apply the term 'environmental attitudes' as a synonym for 'environmental concern' which is also sometimes understood as 'environmental consciousness'. There is also a differentiation between beliefs, attitudes, and values even though these concepts are used rather simultaneously. In order to clarify these terms, it is necessary to link them with the three categories of the concept of environmental concern (cognitive, affective, and conative).

Rannikko (1994) defines environmental consciousness as only one aspect of environmental concern. In line with his argumentation, I suggest that consciousness is an individual state without doing judgments about the object of awareness. Thus, environmental consciousness is equal to the awareness character of the affective attribute of environmental concern. In contrast, beliefs or attitudes already

include a positive or negative emotional aspect of evaluation (the evaluation of an environmental problem with regard to its seriousness). Beliefs are constant and persistent cognitive models of the world or defined situations. For example, someone believes that nature is generally necessary to be protected. Beliefs can be influenced by both affective emotional judgments (derive from direct affective attribution: people like/enjoy nature) or basic knowledge (derive from cognitive processes: people experienced usefulness of natural habitats). Since we already excluded knowledge from the concept definition, I further interpret beliefs as a form of emotional and affective awareness of environmental problems and concern. Attitudes, in contrast, are very specific statements about an object of concern which also include emotional and cognitive aspects of evaluation (Takács-Sánta, 2007). As Rannikko (1994) states, an 'attitude represents a tendency to react positively or negatively to a certain situation, event, person or object' (*ibid*: 58). Attitudes are most often used simultaneously with beliefs (e.g. Stern, 2000) but are considered to be more specific, for example, concerning nuclear power generation or issues of renewable energy production instead of environmental issues as such. Thus, I will also place them under the affective attribute of the concept of environmental concern.

So far, two very basic components remain in the concept as summarized in Figure 2. The affective component includes general beliefs or more specific attitudes towards environmental problems as an expression of awareness or evaluation

of seriousness. The second conative component is linked with the affective one since it transposes attitudes or beliefs into behavior intention for policy support or personal action. Knowledge and behavior (grey part of Figure 2), in contrast, are not considered as necessary components

of the definition of environmental concern any more. Most important, the direction of the arrows in Figure 2 indicates that all that is necessary and sufficient for the concept of environmental concern is the affective and the conative components.

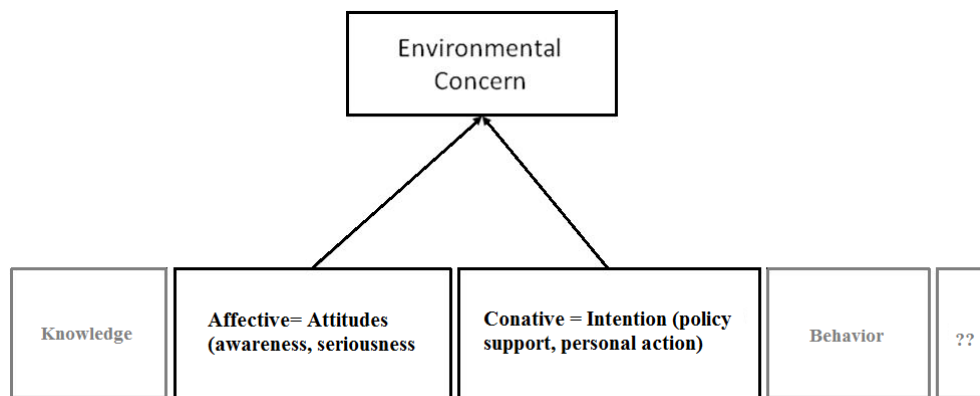


Figure 2. *The concept of environmental concern after first revisions.*

Note: Grey parts are excluded elements of the general concept of environmental concern.

Source: Own conceptualization based on van Liere and Dunlap (1980).

General definitions on environmental concern can now be evaluated according to these components. One example is Bord et al.'s (2000) conceptualization of environmental concern 'as sets of beliefs in particular outcomes connected with pursuing a given line of behavior and the relative rewards and costs connected with those outcomes' (p. 207). We have to admit that this definition is incomplete since it lacks the very important attribute of behavior intention. However, this attribute is a crucial element of the concept since it indicates the seriousness of an individual's environmental concern beyond mere awareness statements (Dietz, et al. 2007). A more complete definition is broad forward by Dunlap and Jones

(2002): 'environmental concern refers to the degree to which people are aware of problems regarding the environment and support efforts to solve them and/or indicate a willingness to contribute personally to their solution' (p. 487, see also e.g. Franzen and Meyer, 2004; Marquart-Pyatt, 2008). Empirical support for this definition comes from several studies. Urban (1986) applies factor analysis which yields precisely the cognitive and the conative component (see Figure 2) and also finds a hierarchical relationship between them with behavior intention being more relevant and binding for actual behavior than awareness or the evaluation of seriousness. Furthermore, Xiao and Dunlap (2007) found two distinct factors (affective

and conative component) which are highly consistent and are characterized by high levels of construct validity.

Values and Interests as the Basis of Environmental Concern

A highly controversial distinction lies between attitudes and general values. In contrast to the more specific, superficial, and often fluctuating character of attitudes, an individual's values are rather stable, internalized cognitive concepts which guide individual behavior or evaluation (Hirsh, 2010; Rannikko, 1994; Schultz, 2001). 'Values are distinct from attitudes or beliefs because they function as an organized system and are typically viewed as determinants of attitudes and behaviors' (Schultz and Zelezny, 1999: 256). Thus, general values influence environmental attitudes, but are not considered as an attribute of the overall concept of environmental concern. However, the ongoing debate about the influence of general personal values sheds light on the character of environmental concern (Stern and Dietz, 1994; Dietz, Stern and Guagnano, 1998; Schultz and Zelezny, 1999; Schultz, 2001; Milfont et al., 2010). Personal individual values in the context of environmental protection reflect on the self (egoistic), on other people (altruistic) or on the environment as such (biospheric) (Stern and Dietz 1994; Fransson and Garling, 1999; Schultz and Zelezny, 1999; Schultz, 2001; Takács-Sánta, 2007). Biospheric values constitute a general understanding of humankind being an existential element of nature which is more or less seen as

sacred and worthy to be protected as such. Reduction in greenhouse gas emissions in this respect is interpreted as a mean to save the planet as a whole and preserve natural habitats or biodiversity independently from implicit dangers for humankind. The altruistic value orientation, in contrast, only refers to individuals' (e.g. health) or even humankind's (e.g. survival) vulnerability to environmental pollution. In this respect, individuals care for citizens who are highly vulnerable towards, for example, droughts or floods caused by increasing global temperatures but would not save the planet in order to help plants or animals. Finally, people's egoistic value orientation motivates to look for their own environmental interest (Soyez, Hoffmann, Wunschmann and Gelbrich, 2009). Thus, citizens living in lower coastal areas which are highly vulnerable to rising sea levels caused by global warming would certainly show higher levels of environmental concern than people who are not as much vulnerable towards negative consequences of climate change.

In general, value orientations strongly focus on geographical and spatial issues as discussed above. Since individual interests are basically of local and short-term perspective, individuals with an egoistic value orientation show environmental concern only for these dimensions. In contrast, people with altruistic and biospheric values would also be very much concerned about environmental problems of global and long-term scale (de Groot and Steg 2007; Milfont et al., 2010). This line of argument points to a more general problem for the concept of environmental

concern. Until recently, environmental concern was conceptualized as single dimension where respondents could only express more or less concern for nature (e.g. Xiao and Dunlap, 2007). Recent research, however, argues for the multidimensional character of environmental concern. Apart from the discussion on adequate attributes for a horizontal dimension of environmental concern (cognitive, conative), there is a number of studies which also suggest a vertical dimension and the existence of second order factors of environmental concern (Kaiser and Scheuthle, 2003; Wiseman and Bogner, 2003; Milfont and Duckitt, 2006, 2010). This second order factor constitutes two very important aspects: a dimension of environmental preservation, derived from a general biospheric or altruistic value orientation, and an environmental utilization dimension which reflects on personal interests supported by egoistic values (Milfont and Gouveia, 2006). This finding can explain the conflict between interest-based and value-grounded environmental concern. So far, both kinds of environmental concern were combined into one dimension, where individuals with short-term interests were considered to be as environmentally concerned as respondents with stable long-term values towards nature in general. Taking these two dimensions into account, we can now distinguish between interest-based concern which is mostly egoistic and short-term in character, and value-based concern characterized as stable, long-term, and grounded in an altruistic or biospheric value orientation. Studies explaining differences in environmental concern among individuals have to take these

two dimensions into account since explanatory factor are either rooted in short-term interests (e.g. geographical aspects, vulnerability, benefits from policies) or in basic personality traits and values of the person *independent* from the current financial situation or other geographical factors.

A definition of environmental concern that combines all arguments discussed so far should consider the altruistic/biospheric and the utilization-dimension as well as geographical and temporal aspects. I argue that someone is concerned about the environment, either in a short-term perspective concerning local changes in nature or in long-term perspective considering both local and global phenomena, if the person (1) generally accepts (global) environmental problems as being serious and (2) agrees towards environmental policies and/or (3) shows the willingness to take personal action in order to mitigate environmental pollution, where the awareness and evaluative components (1) in conjunction with either policy support intention (2) or personal action intention (3) or both constitutes a necessary condition.

This definition includes a hierarchical assumption which characterizes a person who is aware of environmental problems and interprets them as serious threats but has no behavioral intention as being not concerned about the environment. These people might be interested in the scientific process of environmental issues and recognize the risks but have no intention to change their lifestyle. Besides that, there are quite a lot of personal reasons why someone should support environmental policies or demonstrate

intention for personal action in order to mitigate pollution. One reason is financial benefits through, for example, public subsidy programs for small-scale solar cell appliances; another is social pressure or prestige. However, if these people are not aware of (global) environmental problems or do not interpret them as a serious threat, they lack concern for the environment following the definition.

Evaluation of Scales and Measures

The concept of environmental concern is complex and multidimensional when considering all arguments broad forward in the discussion above. Consequently, it can only be conceptualized with a number of carefully selected and formulated items. Current measures of environmental concern differ by both dimensions: the focus on environmental issues and the expressions of concern. Scales and measures should fulfill at least five criteria: reliability (consistency of measurement across environmental issues), content validity (should include all attributes of the concept), convergent validity (internal consistency of attributes), discriminant validity (should be distinct from other concepts such as environmental knowledge or behavior), construct validity (should be related to other concepts in the same way as other instruments).

As has been the matter of controversial discussion, a large number of scales and measures exist. Hawcroft and Milfont (2010) count at least several hundred measures since the 1960s and even talk about an ‘anarchy of measurement’. Thus,

the lack of standardization makes comparison difficult. Even though similar scales are applied by different authors and studies, they are not used appropriately. The context and most often arrangements of the questions differ (e.g. different wording, item order, context of question) (Milfont and Duckitt, 2010) and, thus, reveal non-comparable results. Schultz (2001) further criticizes a lack in theoretical integration where measures are based on different theoretical concepts (content validity). One major problem for theoretical integration is the dual character of the concept of environmental concern. If studies mix interest-based with value-grounded measures of environmental concern, they fail to provide a valid instrument for individual environmental concern across the geographical and temporal dimension. Another frequently found shortcoming of conceptual integration is the lack of all necessary attributes and the inclusion of behavior and knowledge in the overall concept of environmental concern. Furthermore, even though all studies would consider the dual-character and include all attributes adequately, comparison fails if they do not measure the same environmental problems. As Dunlap and Jones (2002) state, comparable measures should therefore focus on items of multiple topics (e.g. land-use, air-pollution, carbon-mitigation) and multiple ways of expression of the concern (awareness, seriousness, policy support, personal action, reliability). I will take this suggestion as a benchmark in order to analyze a sample of selected measures in order to demonstrate how the concept of environmental concern is

operationalized. The measures were selected according to Dunlap and Jones' (2002) review article. Table 2 and 3 give an overview and short evaluation of relevant scales and measures where Table 2 describes measures from the theoretical approach and Table 3 focuses on scales from the policy approach. Furthermore, Table 4 summarizes comparative measures which are widely applied in international social surveys. Following, I will shortly discuss examples from the tables before more recent measures are discussed.

Table 2 shows one of the most prominent and applied scales of environmental concern which is the 'Ecological Attitudes Scale' (Maloney and Ward, 1973) from the theoretical approach. This scale is most relevant since it addresses multiple environmental topics and multiple expressions of concern. The 'Ecological Attitudes Scale' measure is an inventory of 45 items (short version) which includes a verbal commitment scale (behavior intention), an actual commitment scale (behavior) as well as measures for affect and knowledge. Thus, this measure provides both attributes of our definition of environmental concern, even though it does not include a more specific measure for policy support and does not explicitly exclude knowledge and behavior. It is further characterized by high convergent validity between verbal commitment and affect since both sub-scales show distinct correlative patterns which is in line with our definition.

An example from the policy approach shown in Table 3 is the most widely used 'New Environmental Paradigm

Scale' (NEP) (Dunlap and Van Liere, 1978) and also its revised version, the 'New Ecological Paradigm' measure (Dunlap, van Liere, Mertig and Jones, 2000). It includes the sub-scales on a 'humans' ability to upset the balance of nature, existence of limits of growth' and 'humans' right to rule over the rest of nature'. The revised version of the 'New Ecological Scale' adds 'human exceptionalism' and the 'likelihood of ecological crisis' in order to address wider phenomena such as climate change. Both versions are characterized by high internal validity across the scales. Reliability is confirmed by an exploratory factor analysis with a one-factor solution (Skogen, 1999). There is also support for high construct validity since correlations with education, age, and gender show the expected effects (Hawcroft and Milfont, 2010). More critical is the unstable dimensional structure of the measures and poor factorial validity of the sub-scales (Soyez et al., 2009). Concerning content validity, the NEP is highly embedded into the value approach and serves to distinguish between ecocentrism (biospheric) and anthropocentrism (altruistic, egoistic) (Skogen 1999; Milfont and Duckitt, 2010; Soyez et al., 2009) but lacks conative measures. The multi-dimensional character as suggested by Milfont and Gouveia (2006) is only partly addressed through its value-grounded measures. Critical is also the way how the NEP is applied. Hawcroft and Milfont's (2010) meta-analysis of 69 studies and 139 samples using the NEP demonstrate that results dramatically differ according to changes that are made by the researchers (scale length, wording,

Table 2. Overview of scales for measuring environmental concern - theoretical approach

Scale/s	Reliability	Content	Validity			Remarks
			Convergent	Discriminant	Construct	
Maloney and Ward (1973) Ecological Attitudes Scale		High: includes all attributes of the definition; multiple topics	High internal consistence, but also includes knowledge and behavior			Affective, Verbal Commitment, Actual Commitment, Knowledge
Elster (1981) Attitudes Toward the Natural Environment Scale		High: includes all attributes of the definition	High consistency with other scales			
Schahn/Holzer (1990) Topics of environmental concern		High: includes all attributes of the definition; multiple topics	High internal consistence for Knowledge, Verbal Commitment and Affective Commitment, but two versions of behavior			

Source: Dunlap and Jones (2002), own collection.

Table 3. *Overview of scales for measuring environmental concern - policy approach*

	Scale/s	Reliability	Content	Validity			Remarks
				Convergent	Discriminant	Construct	
Tognacci et al. (1972)	'Importance of Pure Environment' 'Attainment of Pure Environment'		Moderate: captures only cognitive and evaluative component	High: internal consistency of the scales		Age, education, gender	
Dunlap and Van Liere (1981)	New Environmental Paradigm Scale		Moderate: includes also behavior which is not part of the concept	High: internal consistency of pollution and conservation			
Klineberg et al. (1998)	Economy/government trade-offs, Assessments of pollution, Pro-environmental behaviors, Ecological worldview		High: captures almost all components	Low: two dimensions of seriousness (local vs. statewide pollution)		Low: no correlation with age, education and gender High: correlation with age, education and gender	Trade off, seriousness, behavior, ecological worldview
Dunlap et al. (2000)	New Ecological Paradigm Scale	High: one factor solution of overall scale	Low: includes only cognitive component and lacks conative part	High: but just for the specific component			

Source: Dunlap and Jones (2002), own collection.

Table 4. Overview of applied comparative measures of environmental concern

		Validity				
Scale/s	Reliability	Content	Convergent	Discriminant	Construct	Remarks
Carman (1998)	Environmental Policy Support	High: included all components	Confirmed three dimensions of environmental concern: seriousness, policy support and personal action (via confirmatory factor analysis)			Variety of countries
Dunlap et al. (1993)	Health of the Planet	Includes all components (reflective concept), applies specific and general scope, recent and future perspective			GDP: dimensions have the expected effects	14 variables, 24 countries
Inglehart (1990), Inglehart and Merrig (1995)	Environmental Protection Index, World Value Survey	Low: considers only two out of three components, only pollution, global vs. local measure	Low: no justification of index construction, no internal consistency		GDP: indicates the opposite effect than when deconstructed via Principal Component Analysis	Inconsistent variables across the waves, clearly identified dimensions: awareness, policy support and willingness; however, construct validity is not satisfactory

Source: Dunlap and Jones (2002), own collection.

and context of the questions). These differences substantially decrease comparability of the same scale across different studies.

In general, recent international surveys apply measures for environmental concern, but neither the 'International Social Survey Programme' nor the 'Eurobarometer' or 'European Social Survey' provide sufficient measures to distinguish between environmental concern based on individual interests or values. One critically discussed example in Table 4 is the 'Environmental Protection Index' by Inglehart (1995) in the World Value Survey. The rather small number of items lack reliability and (content, convergence and even construct) validity (for a critical discussion see Dunlap and York, 2008). Consequently, measuring environmental concern with international survey data is highly critical.

A very recent development is the environmental attitudes inventory by Milfont and Duckitt (2010). This measure highly demonstrates a reliable and valid operationalization of environmental concern while taking horizontal attributes (cognitive and conative components of the definition) as well as the vertical dimension (interests = utilitarian vs. value based concern = moral/altruistic) into consideration. The inventory measures twelve primary factors which perform on two distinct higher order factors (five on utilization and seven on the moral/altruistic aspect). They are further highly consistent (convergent and discriminant validity), reliable, and form a hierarchical structure (Milfont and Duckitt, 2010). Even though there is still discussion about

the methodological and theoretical distinction between both higher order factors, this measure can be interpreted as the up-to-date scale for an appropriate operationalization of the concept of environmental concern.

Conclusions

Environmental concern is a very complex but widely used concept. It captures important but hidden issues of time and space, combines different sub-concepts of the environment and concern, and addresses a whole range of disciplines. This article suggests a multidimensional conceptualization. On the horizontal dimension, the two attributes of environmental concern are the affective (awareness, evaluative) and conative (personal behavior intention, policy support intention) component excluding environmental behavior and knowledge. Higher order factors on the vertical dimension distinguish between interest-based (utilization: egoistic) and value-based (preservation: moral/altruistic) environmental concern. Both dimensions successfully include concern for short- as well as long-term environmental problems on the local or global scale.

However, the complexity of the concept also challenges existing measures and scales. As a consequence of the discussion presented in this article, comparing environmental measures across studies using different concepts of environmental concern are even more critical if they (1) address different geographically and temporally distinct environmental issues and (2) do not distinguish between interest-based and value-grounded individual

concern. Even highly prominent scales like the NEP have problems to consider both issues and are applied differently among social researchers. Furthermore, available international survey data only include a small number of items on environmental concern and are not able to address the multidimensional character of the underlying concept.

New environmental measures such as the environmental attitudes inventory (Milfont and Duckitt, 2010) are promising instruments since they learn from past mistakes, conceptualize environmental concern independently from behavior or knowledge but

also consider its multidimensional character. Unfortunately, these data are not public available. They are mostly locally restricted and not conducted annually. Future research should therefore focus on developing methodological instruments which capture the whole nature of the concept of environmental concern. The aim should be to end up with a rather small number of items that sufficiently measure all aspects of environmental concern, but which can be easily included in international surveys in order to provide reliable and valid data to the research community.

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