

# The environmental action scale: Development and psychometric evaluation



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## ABSTRACT

The environmental action scale measures level of engagement in civic actions designed to have a collective impact on environmental issues. These actions are seen as distinct from personal practices because environmental actions are more collective in nature and focus on system-level change. The scale includes two sub-factors: one that is connected with what we are calling “participatory actions” and one that we label “leadership actions”. Each of the actions in the scale is rated for frequency of engagement. Following a rigorous six-step process, the scale was developed and proposed items were tested in a diverse North American sample. The scale was refined into the final 18-item scale which was tested on two additional samples; one international sample comprised of students from six different countries, and one consisting of known environmental activists. Analyses indicated that the final scale showed good reliability, and provided a valid measure of engagement in environmental actions.

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## 1. Introduction

### 1.1. The environmental action scale: development and psychometric evaluation

In response to growing concerns about serious environmental threats such as global climate change, an increasing number of psychologists are joining the ranks of those who are promoting environmental sustainability (APA, 2010; Gifford, 2008; Harré, 2011). So far, most efforts of psychologists have focused on mitigation by fostering changes in people's personal practice, such as diverting waste through recycling and composting (Dittmer & Riemer, 2013). Increasingly, authors such as Kenis and Mathijs (2012), Ockwell, Whitmarsh, and O'Neill (2009), and Rouser-Renouf, Maibach, Leiserowitz, and Zhao (2014) point out,

however, that there are significant institutional and structural barriers to changing these types of behavior. They therefore conclude that grass-root organizing and citizen activism is “the most efficient method of achieving emission reductions” (Rouser-Renouf et al., 2014, p.163). Currently, the prevalence of these types of environmental actions is relatively low in the general population (e.g., for the USA see Leiserowitz, Maibach, Rouser-Renouf, Feinberg, & Howe, 2012). In response, courses and programs are being developed to specifically encourage environmental civic actions, especially among young people (Hegarty, Thomas, Kriewaldt, Holdsworth, & Bekessy, 2011; Riemer, Lynes, & Hickman, 2013). Little empirical knowledge, however, is currently available about what types of programs are most effective in engaging people in environmental actions as compared to encouraging behavior changes at a personal level (Kenis & Mathijs, 2012; Riemer et al., 2013). One barrier to the empirical investigation of these types of program may be the lack of a psychometrically sound measurement scale for assessing engagement in environmental actions. In response, the Environmental Action Scale (EAS) was developed to provide a comprehensive, valid, and reliable measure to facilitate the empirical evaluation of programs to foster such actions and the development of theory related to engagement in environmental action. This paper describes the conceptual foundation, the development, and psychometric evaluation of the EAS.

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### 1.1.1. Conceptual and measurement considerations

Dono, Webb, and Richardson (2010) rightly point out that there is some conceptual confusion in the literature regarding the distinction of environmental “behaviors”, “action” and “activism”. Often the term environmental (or pro-environmental) “behavior” is used both as an umbrella term as well as a specific term for certain kinds of behaviors. For the purpose of presenting a scale that is intended to measure environmental “action”, it is therefore important to clarify what its defining features are and how it is differentiated from the other related concepts.

For the purpose of this paper we are defining environmental actions as intentional and conscious civic behaviors that are focused on systemic causes of environmental problems and the promotion of environmental sustainability through collective efforts. These actions range from low-level participatory civic action, such as informing oneself about environmental issues and participating in community events, to highly involved and political leadership actions such as organizing a protest. Engaging in environmental actions is seen as distinct from changing personal practice, which is focused on reducing the environmental impact of individual private-sphere behaviors such as home energy use and transportation to school or work. Defining features of environmental actions are that they are civic behaviors (as compared to intentions or value) that a person consciously and intentionally engages in to create a positive (mostly indirect) impact on the environment through collective and – to varying degrees – political change. Engaging in these actions often requires specific types of competencies (i.e., action competence). In the following sections we will elaborate these different conceptual features of the definition by critically reviewing the relevant literature and considering measurement related questions as appropriate.

### 1.1.2. Environmental

Defining the first part, that is “environmental”, seems relatively straightforward. Stern (2000), for example, defines *environmentally significant behavior* (which we use here as an umbrella term as we will discuss further below) as “the extent to which it changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere itself” (p.408). That is, these are things humans do that have a positive impact on the natural environment, such as buying organic produce (although this definition does not provide a specific direction of impact, it is implied as positive in the remainder of Stern’s article). According to Stern (2000), these impacts can be direct, such as purchasing a car that produces significantly less carbon dioxide, or indirect, such as raising awareness about environmental issues or advocating for pro-environmental policy changes (with the assumption that those indirect actions will facilitate an actual impact on the physical world). It is noteworthy that in the context of the sustainability discourse environmental issues are seen as significantly interconnected with other social issues such as social justice (Riemer & Schweizer-Ries, 2012). Consequently, taking actions related to sustainability is often more broadly defined than what we are focusing on with this current scale. Stern (2000) also points out that some behaviors are intended to have a positive impact on the environment but that impact does not actually materialize. If the organic produce, for example, is imported from a distant country and is heavily packaged, the net impact of buying an organic produce compared to a conventional one could actually be negative. As a remedy to this dilemma between intent and actual environmental impact, Stern (2000) proposes another definition for environmentally significant behavior, that is, “behavior that is undertaken with the intention to change (normally, to benefit) the environment” (p.408). While the first definition given is important when trying to assess the environmental impact of changes in

human behavior – especially in regard to differentiating between low and high impact behaviors – the latter is more relevant in regard to understanding what individual and contextual factors drive people to engage in environmentally focused behaviors. For conceptual clarity, we will use Stern’s term “*environmentally significant behaviors*” to refer to behaviors that fit the first type of impact-related definition while “*environmental behavior*” is used as an umbrella term to refer to any behavior intended by the actor to have a positive impact on the environment. Environmental actions are then a specific type of environmental behaviors. In most cases, the actual environmental impact of these actions is indirect and difficult to assess.

### 1.1.3. Actions versus changing personal practice

Providing conceptual clarity regarding the term “action” is more challenging. From a psychological perspective it is difficult to differentiate between behavior and action as one is often used to define the other. A common definition for behavior, for example, is: “the actions by which an organism adjusts to its environment” (American Psychological Association, n.d.). The main intention with this definition is to describe something that a person (theoretically) can be observed as doing such as using the voice to communicate or driving a car. This differentiates behaviors and actions from concepts such as intentions, motivation, attitudes, values and emotions, which can only be inferred (e.g., through communication). There are many different types of behaviors that are subsumed under this general category such as instinctual motor movements, communication, habits, and complex decisions. Some key distinctions are related to the level of consciousness, the degree of intentionality, the complexity, the amount of effort it takes, and the timing. When authors refer to environmental behaviors they typically mean decision-making, habits and other routinized behaviors that are related to a person’s personal practice, such as house-hold energy use, producing and diverting household waste, purchasing of products and services with environmental impact, and use of transportation. These behaviors related to personal practices are also referred to as pro-environmental behaviors (e.g., Kollmuss & Agyeman, 2002), ‘environmental-friendly behaviors’ (Tindall, Davies, & Mauboules, 2003) or ‘private-sphere behaviors’ (e.g., Stern, Dietz, Abel, Guagnano, & Kalot, 1999). We will refer to these as *personal practices* as the term ‘pro-environmental behavior’ can be misleading and sometimes has included other types of behaviors such as giving money to an environmental organization (e.g., Dono, et al., 2010).

What is confusing in the literature is whether a term such as “pro-environmental behavior” is referring to the act of changing a personal practice (e.g., making a plan to bike to work, buying a bike and relevant gear, and figuring out the bike route) or to the target practice itself (e.g., biking to work). Kollmuss and Agyeman (2002), for example, understand pro-environmental behaviour as “behavior that consciously seeks to minimize the negative impact of one’s actions on the natural and built world” (Kollmuss & Agyeman, 2002, p.240), which Dono et al. (2010) rephrased as “reducing the negative impact of one’s actions” (p.178) which could suggest an intended change to an existing practice. In most cases, scales intended to measure these types of behaviors ask about the target practice such as “How often do you bike to work?” While it may be pertinent to further explore the difference between the change in personal practice and the personal practice itself, for the purpose of this current discussion and the development of the EAS, we consider environmental actions as distinct from either as will become more clear below.

Jensen and Schnack (1997), propose to use the term “environmental action” to refer to things that a person does that are intentional, or consciously undertaken with reference to

environmentally driven motives and reasons. This description in itself is not sufficient to differentiate environmental actions from consciously and with environmentally-focused motives pursuing personal practices with a relatively low negative environmental impact. A defining characteristic of taking environmental action – as we understand it – as compared to focusing on personal practices, is the emphasis on changes at the societal rather than individual level. We agree with [Jensen and Schnack \(1997\)](#) who point out that “that environmental problems are structurally anchored in society and our ways of living. For this reason, it is necessary to find solutions to these problems through changes at both the societal and individual level” (p.164). Environmental actions are often described as collective and system-oriented in nature ([Dono et al., 2010](#)). [Jensen and Schnack \(1997\)](#), argue that environmental action is closely related to democracy as a form of participation and is targeted on the root causes of a problem. Similarly, [Riemer, Lynes, and Riemer \(2013\)](#) have described environmental action as the activities of engaged citizens. [Clayton \(2003\)](#) suggests that “environmentalists by definition tend to focus on the larger community – the species or the ecosystem” (p.55). These authors contrast this orientation from the individualization of the problem, which assumes that change will happen through individuals acting as individuals. The anticipated outcomes of environmental action are – to different degrees – collective outcomes ([Lubell, 2002](#)). Because of the collective nature of these actions, participation in these is connected to the belief that collective action will lead to success in improving a common good and that one’s participation will contribute to that ([Lubell, 2002](#); [Rouser-Renouf et al., 2014](#)). The collective nature also explains why social connections to other people engaged in environmental action have been found to be an important predictor of engagement in these actions ([Tindall, Davies, & Mauboulés, 2003](#)). [Jensen and Schnack \(1997\)](#) argue that engagement in environmental action also requires a specific set of skills and knowledge (e.g., the ability to envision an alternative to the current system), which they termed ‘action competence’. The belief that one lacks such competence can be an important barrier to become engaged in action ([Rouser-Renouf et al., 2014](#)).

#### 1.1.4. Environmental actions as civic actions

There is a lack of clarity in the literature which types of environmental actions should be grouped together under a common category. A common distinction in the literature has been made between activist behaviors and what we have defined as personal practices ([Dono et al., 2010](#)). Based on their review of the literature on environmental activism, [Séguin, Pelletier, and Hunsley \(1998\)](#) suggest that activist behaviors include things such as: taking action on a particular environmental problem or conservation issue, identifying strongly with a social group, signing a petition or giving money to a group, organizing a campaign, attempting to change the attitudes of policy makers, citizens, and those who threaten the environment, being a member of an environmental organization, and engaging in environmental protection behaviors. These authors as well as [Dono et al., \(2010\)](#) provide convincing evidence from the literature that these types of behaviors are empirically distinct from changing personal practices for environmental reasons. For example, they tend to correlate with different types of predictors. While personal practices are often found to be related to individual characteristics such as demographics, personal beliefs, and attitudes as well as social norms, activist behaviors seem to have only weak connections to these predictors and are more likely linked to contextual factors (e.g., local environmental problems) and social connections (e.g., frequent contact with people who are also involved in environmental activism).

There is less conceptual clarity, however, in regard to the characteristics that make activist type behaviors distinct from a focus on

personal practices. [Séguin et al. \(1998\)](#) propose that the distinction is related to the difficulty and effort required to carry activist behaviors out, which would explain why only the very committed environmental activists engage in these behaviors. There are two problems with this conceptualization. First, there are some non-activist behaviors that can be difficult and require a lot of commitment, such as installing a solar panel system in a house, while there are activist behaviors that require relatively little effort, such as participating in a demonstration. Second, from a measurement point, this differentiation in regard to the degree of difficulty would still be considered a one-dimensional scale rather than warrant distinct scales.

In Stern’s ([Stern, 2000](#); [Stern et al., 1999](#)) typology of environmentally significant behaviors he links environmental behaviors in general to environmentalism as a social movement and differentiates highly committed and engaged activist behaviors from less intense behaviors in support of the environmental movement. In the latter he includes ‘low-commitment active citizenship’ (e.g., contributing to environmental organization; signing a petition) and support of policies that may require some kind of personal sacrifice for the benefit of the environment (e.g., carbon tax; [Stern et al., 1999](#)) and private-sphere behaviors. In the more recent article ([Stern, 2000](#)) he refers to the citizenship behaviors and policy support as ‘non-activist behaviors in the public sphere’ and also adds another general category of ‘other environmentally significant behaviors’. As the name suggest, this latter category is not clearly defined and subsumes other relevant behaviors that may not fit within the other types, such as an engineer developing a product with a low environmental impact. Because this type is theoretically not clearly defined, has not been operationalized, and may include behaviors that are specific to certain professions, we did not consider this category further for the purpose of this scale. As discussed earlier, there is good conceptual and empirical justification to consider private sphere behaviors (i.e., personal practices) as distinct from public-sphere behaviors. The question, however, is whether activist and non-activist public-sphere behaviors indeed represent two different latent dimensions of two distinct scales or whether they are better operationalized as two ends of one general scale of environmental action.

Before we approach an answer to that question it is important to note that for the purpose of this current scale development we will not consider the policy support type included in the typology of [Stern \(2000\)](#) for two reasons: First, the way it has been operationalized (e.g., ‘I would be willing to pay much higher taxes in order to protect the environment’; [Stern et al., 1999](#), p.96) indicates that these are not actual behaviors but behavioral intentions for behaviors that ultimately the person has relatively little control over. Second, for the person to actually support the policy through behavior they would have to engage in either participatory civic action (e.g., voting for a politician who advocated for the policy) or activism (e.g., organizing a petition) to support the policy, which is represented by the other two categories in [Stern \(2000\)](#) typology. This reduces the above question to whether activist behaviors and citizenship behaviors warrant two distinct scales or are different aspects of the same environmental action scale.

There is some empirical evidence to support that activist and citizenship behaviors are part of the same dimension. As potential evidence against this assumption, [Stern \(2000\)](#) indicates that he and his colleagues have found empirical evidence that activism is distinct from citizenship behaviors. But, the actual evidence he presents does not support that assumption. In one of the two cited studies ([Stern et al., 1999](#)), which used data from a general household survey, they operationalized activism with only one item tapping into participation of demonstration and protest. Not only is the base-rate for this behavior very low in the general

population (7% reported engaging in this behavior in the last 12 month in the survey) but measurement theory suggests that a valid scale needs to include multiple items that together span the range of the latent dimension to be measured (Smith & Smith, 2004). That is, it needs to include items that are easy to endorse and items that are difficult to endorse. Thus, one item is not sufficient to measure a complex phenomenon such as environmental activism, especially in the general population. In the other cited study (Dietz, Stern, & Guagnano, 1998), there are only two “collective and political behavior items” (p.455) mentioned and both are actually citizenship behaviors in the 2000 version of Stern’s typology (i.e., belonging to an environmental group and signing a petition). Séguin et al. (1998) included both types of behaviors and found a one-factor model to be the best fit in their explorative factor analysis. Using the same six items in their study on environmental activism and social identity, Dono et al. (2010) confirmed the one factor. The use of only six items in a sample that has a relatively low base rate of those behaviors may have prevented the discovery of separate factors, though. Interestingly, in the study by Dono et al. (2010) they used both the scale by Séguin et al. (1998) to measure activism and the non-activist items from the Stern et al. (1999) study as a measure of ‘pro-environmental behaviors’. The latter included the citizenship behavior items, which Séguin et al. (1998) considered to be part of environmental activism. While Dono et al. (2010) did not report that they conducted an omnibus explorative factor analysis with all of the items together, the path analysis showed a very strong relationship (.73) between the scores on the Seguin et al activism scale and the Stern et al citizenship scale. Thus, currently the evidence that these concepts are closely related is stronger than the evidence that they are distinct.

We conclude that because environmental actions are environmentally focused activities of engaged citizens, they include both types of Stern’s (2000) typology, citizenship and activism behaviors, as those are both considered civic actions (Riemer et al., 2013). We propose that the difference is a matter of degree in regard to type of participation and the political pressure of the action. At the low end of the spectrum are simple participatory citizenship actions such as keeping oneself informed about a societal issue and engaging with others in conversations about those issues. These are relatively uninvolved, simple behaviors that create almost no political pressure. Based on our experience with young people becoming engaged in environmental action, this is where most people start because these actions require relatively little action competence. As people become more involved, they start to participate in collective activities such as community events and protests and joining an environmental group or organization. While many individuals never go beyond this level, some take on active leadership roles in organizing events and groups. These actions are more complex and require a different level of action competence, especially related to leadership skills. At the end of the spectrum then are leadership actions that are more political in nature such as organizing a boycott or a protest. Stern et al. (1999) point out that the boundary between those who are engaged in a more supportive way and those who engage in leadership actions (which they refer to as activists) is ‘fuzzy’ and they refer to Snow, Rochford, Worden, and Benford (1986) in noting that people often move back and forth in these roles, which provides further support to consider them to be different levels of the same dimension of engagement in environmental action.

From this and the earlier conceptual consideration we conclude that we can expect a one-dimensional scale of engagement in environmental action that ranges from low-intense and simple participatory civic actions to highly committed, organized, and political leadership actions. Following Séguin et al.’s (1998) review we also consider environmental protection behaviors (i.e.,

environmental conservation efforts) as environmental actions even though they may not be considered civic actions in the traditional sense. There are, however, primarily collective in nature and they are focused outside the individual and, thus, distinct from changing personal practice. It could be argued that sometimes people change personal practices in order to raise awareness about environmental issue such as Matthew Luxon and Waveney Warth who tried to live waste-free in their home in New Zealand for a year, which inspired a lot of other people (Rubbisfree, n.d.). While these changes to personal practice could be considered environmental actions based on our definition, we decided not to include them because those cases are relatively rare and could result in unnecessary confusion when included on a measurement scale. We conducted explorative psychometric analyses (see below) to investigate whether the conceptual decisions presented in this review can be confirmed with empirical data.

To summarize, our intention was to develop a comprehensive psychometric scale that would reliably assess different levels of as well as changes in engagement in intentional and conscious civic behaviors (including conservation efforts) that are focused on systemic causes of environmental problems and the promotion of environmental sustainability through collective efforts. We chose to use the term *environmental actions* for our scale for four main reasons. First, the term ‘behavior’ is closely associated with personal practice behaviors and is commonly used in that context. Second, the term ‘taking action’ is often associated with engaging in collective civic actions that go beyond personal practices. Third, the conceptual confusion regarding the term activism discussed above warrants the use of a different term as well. This term should be inclusive of both low-intense civic actions and political activism behaviors, which the term ‘environmental action’ provides. Fourth, many people who engage in environmental actions are hesitant to identify themselves as activists. In fact, Rouser-Renouf et al. (2014) found that the identification with being an activist was the biggest barrier to becoming engaged in climate change activism in the USA. This negative connotation of the term activism was confirmed for other countries as well in our discussion with the international experts we consulted for the development of the EAS (see below). Thus, a more neutral term was necessary for the purpose of what the EAS is supposed to assess.

## 1.2. Scale development

While several of the articles discussed above include a list of items that are indicators for different types of environmental action, none of them describe an actual measurement scale that represents the full range of environmental actions and was developed using a rigorous psychometric measurement evaluation. Our goal was to develop a comprehensive scale based on both traditional psychometric considerations (e.g., factor analysis) as well as more modern measurement approaches (i.e., Item Response Theory). For this purpose, several steps were taken in the development of this scale, following the guidelines described by DeVellis (2003) and the procedures described by Riemer et al. (2012), who also combined these two types of measurement approaches.

First, we determined that this scale should provide a measure of environmental action (as defined above) for youth (16–26) and adults, and should do so within a specified time frame, to allow for the measure of changes in engagement in those actions over time. It was determined that individuals would rate themselves in regard to the extent of their past engagement in each action over the past six month to account for the relative infrequency of some of the behaviors.

Then, an initial item pool of 65 items were generated based on a general review of the literature, previous research and in

consultation with environmental activists and researchers from different countries representing both economically developing and developed countries in the global North and South. In identifying the initial item pool we considered multiple relevant aspects of environmental actions. For example, we strove to generate items which represented the full range from simple citizenship behaviors that many people engage in (e.g., informing yourself about and issue and having a conversation with friends and families about the issue) to highly political leadership actions that only highly engaged activists take on (e.g., organizing a protest). We also wanted to ensure that the variety of environmentally focused actions in different countries are represented, such as conservation efforts, participating in educational event, and being part of a group that specifically focuses on the connection of environmental issues with other social issues such as an environmental justice organizations. Following the earlier conceptual discussion the main criteria were to have sufficient items of different level of political pressure and degree of active participation and leadership. Items at each of these levels were oversampled in order to be able to select the psychometrically strongest in the following steps. We also included several personal practice behaviors to allow for the possibility that empirically they do not warrant a distinct scale, as we hypothesized based on the discussion above.

After the initial pool and format of the items were established they were reviewed, tested and refined in multiple steps. First, items were refined based on cognitive interviews (Willis, 1999) to evaluate the respondents' understanding and interpretation of the scale items. Next, the items were reviewed by several researchers who do research related to environmental action, and by scholars from Bangladesh, India, Uganda the USA and Germany to ensure their relevance in a broad range of cultural and political contexts. At each stage, items were added, deleted, or reworded for clarity, resulting in a preliminary 36-item test version of the scale.

Following this, we identified other measures which could be used to validate the environmental action scale. For some individuals, the natural world provides an important focus for the self; Clayton described this as an "environmental identity" (Clayton, 2003). Environmental identity may be particularly significant in relation to personal engagement in environmental activities and actions (Whitmarsh & O'Neill, 2010). Identified environmental activists have been found to score significantly higher than non-activists on both Environmental Identity and on another (single-item) measure of environmental interest, (Matsuba et al., 2012), so both were included in the survey package.

Another step was to administer the survey package to participants, to evaluate and further refine the newly developed measure. Two distinct samples were recruited. A student sample provided a broad base of emerging adults, and a general non-student sample added diversity in terms of age and background. We evaluated the scale items using a comprehensive mixed-method procedure described by Riemer and colleagues (Riemer & Kearns, 2010; Riemer et al., 2013). Based on these analyses, the scale was reduced to the final 18 items. We are presenting some more details regarding these analyses in the next section.

In the final step we confirmed the quality and psychometric properties of the 18-items version presented in this paper (see Scale Evaluation below).

## 2. Preliminary analyses and initial evaluation of the scale items

### 2.1. Methods

A convenience sample of 205 undergraduate university students (69.8% female) attending a midsize Canadian university were

recruited from the psychology participant pool. Students were between 16 and 62 years (mean age = 18.88 years, SD = 3.34). Most were studying full time (96.1%), worked less than 5 h per week (75.1%), and volunteered less than 5 h per week (86.3%). A more diverse adult sample of 161 individuals (44.7% female) was recruited using Amazon's Mechanical Turk (MTurk) website. Mechanical Turk is a crowdsourcing internet marketplace for work, where computer programmers can post tasks for a network of individuals who perform those tasks on-line for monetary payment. Participants in this sample lived in the United States, and were between 18 and 68 years (mean age = 33.49 years, SD = 11.02). Most were not students (80.1%), were working at least 15.5 h per week (69.6%), and volunteered for less than 5 h per week (79.5%). Participants from these two samples were combined for analyses, resulting in an overall sample of 366 participants.

Participants were recruited using online research invitations. The student sample was recruited using the psychology research experience pool; students received credit towards their psychology mark for participating. The MTurk sample was recruited via a posting on Amazon's Mechanical Turk website. MTurk participants received a payment of \$.50 into their Amazon account, which is comparable to other research studies which are posted there. The research was described and participants were invited to complete the survey by clicking on a link. The on-line survey was hosted on Survey Monkey. All procedures were approved by the Research Ethics Board of Wilfrid Laurier University.

### 2.2. Evaluation of the scale items

The Expectation–Maximization algorithm (Schafer & Olsden, 1998) was used to impute values for missing scores on the EAS scale (4 or less cases on any given item, for 36 items).<sup>3</sup>

In preliminary analyses, test-retest reliability of the scale was assessed by evaluating the consistency of the responses of a subset of the student sample over time. Twenty–six percent of the student sample<sup>4</sup> (n = 27; 26% female) completed the follow-up portion of the survey. Surveys were completed an average of 13.67 days after they completed the survey (range = 11–17 days). The intraclass correlation coefficient between the EAAS scores on the first survey and the follow-up survey was very high (ICC = .97).

Using elements of classical test theory and item response theory (i.e., Rasch measurement; Smith & Smith, 2004) we were able to assess the interrelationship of the items, investigate the dimensionality of the scale, and identify stronger and weaker items as well as items that are redundant in regard to providing information about the latent phenomenon. The goal was to further reduce the number of items. Classical test theory (CTT) was used to examine properties of the individual items, and item response theory (IRT) was used to further assess the individual items and their relationship to the overall scale. Specifically, we applied the rating scale model (RSM) with polytomously scored items (Andrich, 1998) that is part of the Rasch modeling approach. This analysis provides item difficulty ratings and item fit statistics (infit and outfit). Item difficulties show where an item is most precise in estimating the level of engagement in environmental actions (on a logit scale). Fit statistics quantify how well an item fits with the proposed model of a scale that ranges from the low-level of the latent dimension to the high-level. Although the RSM is a 1-parameter logistic model,

<sup>3</sup> Participants who responded to less than 85% of the items on the scale were eliminated from the sample.

<sup>4</sup> Because the survey was completed at the end of term, only a small portion of the sample had completed the survey early enough to allow sufficient time for us to assess consistency over time.

WINSTEPS 3.81.0 (Linacre, 2014) provides an estimate of each item's discrimination, or its ability to differentiate persons with high and low symptom severity. In addition, WINSTEPS provides item-person maps that indicate how individual items are distributed across the range of the scale. The ideal scale has an equal distribution of items across the complete range of the assessed latent trait (in this case from low-intensity participatory action to highly political leadership actions). Rasch modeling analyses (Smith & Smith, 2004) were used to assess infit, outfit, and discrimination scores.

Although some items were eliminated on the basis of their statistical properties, items with a non-normal distribution were not automatically removed from the data set, as it was expected that some of the items referring to very engaged activities would be applicable to very few respondents, and it was important to keep an assortment of these items, to ensure there was a sufficient variety of the very difficult actions which are characteristic of only the most engaged activists. In general, retention of items was guided by the following inclusion criteria: high inter-item correlation ( $>.4$ ), high item–total correlations ( $>.4$ ), good infit and outfit (.6–1.4 for MSQ), and have a discriminate score close to one ( $>.8$ ). Items were selected such that there was a distribution of items across the measure scores, and such that redundancy in items in regard to their contribution to the overall scale score was avoided. Two active citizenship behaviors were found to be highly correlated, and conceptually similar, so they were combined in later analyses, and retained in the scale as one item (see item 5). Models that included the personal practice items performed more poorly on several of the indicators (e.g., factor analysis model fit indicators and Rasch model item fit criteria). On the bases of these analyses, the personal practice items were separated from the scale and other redundant or poorer scale items were eliminated so that the initial item pool was reduced from 36 items to 18 items.

Besides the overall factor of engagement in environmental action, two sub-factors emerged out of these explorative analyses. One group of items comprised actions which tend to demonstrate active environmental leadership such as organizing a boycott. These actions align most closely with what is commonly understood as environmental activism and we will refer to as *leadership actions*. The second group of items consists of actions that are more participatory in nature and tend to require less effort and personal risk. These items, such as participating in community events and talking with others about environmental issues, may be described as *participatory actions*. As discussed earlier, these may represent initial stages of more involved activism or they could simply be a different way of taking action for the environment.

### 3. Final scale evaluation

Next steps focused on an evaluation of the 18-item final scale. The scale was administered to students from several different countries, and to a group of known environmental activists. Using classical test theory and analyses of the international sample, the interrelationships of the items and the internal reliability of the overall scale were assessed. Item response theory analyses provided additional information about the relationship of individual items to the overall scale in this international sample. Validity of the scale was assessed in several different ways. Convergent validity of the scale was supported by the scale's significant positive relationship with other measures, including a self-rating of interest in the environment, and environmental identity (Clayton, 2003). Concurrent validity of the scale was assessed by the comparison of the scale scores of a group of known environmental activists with scores of a more random group of participants, who were not recruited based on their environmental engagement. Discriminant

validity was established by demonstrating that this environmental action scale is related to but distinct from measuring personal practice behaviors.

#### 3.1. Methods

An international sample of 281 participants was comprised of individuals from Bangladesh ( $n = 59$ , 47% female), Germany ( $n = 25$ , 36% female), India ( $n = 74$ , 84% female), Uganda ( $N = 102$ , 36% female), and the United States of America ( $n = 21$ , 57% female); see Table 1. Participants were between 18 and 45 years of age ( $M_{age} = 22.86$ ,  $SD = 3.66$ ). The majority reported that their economic position within their country was average or better (88%), and were studying full time (76.9%; 11.6% reported they were not a student).

Participants were initially recruited by collaborators in each country to participate in the validation study. They sent individuals in their networks an e-mail invitation, which contained a link to the survey information. Participants in Uganda completed the questionnaire on paper; for all others, the survey was hosted by Survey Monkey. In each country, participants were included in a lottery draw for a prize of \$100 CAN. All procedures were approved by the Research Ethics Boards of Wilfrid Laurier University and the collaborating universities (Makerere University, University of Dhaka, Western Kentucky University, Xavier's College, University of Bombay, Saarland University).

An additional sample consisted of 18 known environmental activists (50% female); see Table 1. These individuals were part of the second author's network, and were actively involved in environmental organizations. Environmental activists were between 20 and 64 years of age ( $M_{age} = 33.28$  years,  $SD = 11.27$ ). Most indicated that they were not students (55.6%), and were working at least 15.5 h per week (61.2%). Half of this sample indicated that they volunteered for more than 5.5 h per week (50%). Individuals listed in a database of environmental organizations were invited to participate via an e-mail communication. Interested participants completed the survey, which was hosted on Survey Monkey, electronically. The questionnaire package consisted of demographic information, the shortened EAS scale, and the Environmental identity scale which are described above.

#### 3.2. Measures

##### 3.2.1. Demographic questionnaire

Participants completed several demographic questions including age, gender, student status, work hours per week and engagement in volunteer activities. Participants also provided a self-rating of environmental interest, by rating "how interested are you in environmental issues" on a five-point scale (from 1 to 5).

##### 3.2.2. Environmental action scale

Participants were asked to rate the 18 items of the Environmental Action Scale (EAS) in response to the following question: "In the last six months, how often, if at all, have you engaged in the following environmental activities and actions?" Items were rated on a 5-point scale from 0 (never) through 2 (sometimes) to 4 (frequently).

##### 3.2.3. Environmental impact behaviors

Four additional environmental impact behaviors common in all involved countries (e.g., "Made environmentally conscious food choices", "Made a decision to reduce my consumption of material goods by buying less.") were included with the environmental action items, and were rated on the same 5-point scale. These were included to assess the EAS validity. Fourteen additional items

**Table 1**  
Items, means, standard deviations, and Rasch measurement statistics.

Item	Classical test theory			Rasch measurement			
	M	SD	Item-total r	Measure score	Discrimination	Infit MSQ	Outfit MSQ
1. Educated myself about environmental issues (e.g., through media, television, internet, blogs, etc.)	2.88	1.08	.43	−1.93	.63	1.11	.77
2. Participated in an educational event (e.g., workshop) related to the environment.	1.67	1.31	.65	−.66	.94	.95	.97
3. Organized an educational event (e.g., workshop) related to environmental issues.	.64	1.06	.63	.63	.98	1.14	1.19
4. Talked with others about environmental issues (e.g., spouse, partner, parent(s), children, or friends).	2.93	1.06	.50	−1.98	.73	1.00	1.40
5. Used online tools (e.g., YouTube, Facebook, Wikipedia, MySpace Blogs) to raise awareness about environmental issues.	1.68	1.33	.60	−.66	.69	1.17	1.21
6. Used traditional methods (e.g., letters to the editor, articles) to raise awareness about environmental issues.	.80	1.04	.65	.39	.95	.95	.86
7. Personally wrote to or called a politician/government official about an environmental issue.	.40	.83	.57	1.18	1.01	1.12	1.02
8. Became involved with an environmental group or political party (e.g., volunteer, summer job, etc.).	1.35	1.42	.80	−.31	1.31	.81	.72
9. Financially supported an environmental cause.	.82	1.10	.56	.35	.75	1.24	1.23
10. Took part in a protest/rally about an environmental issue.	.94	1.23	.71	.20	1.05	1.02	.96
11. Organized an environmental protest/rally.	.30	.76	.59	1.47	1.13	1.00	1.04
12. Organized a boycott against a company engaging in environmentally harmful practices.	.43	.93	.43	1.08	.83	1.65	1.74
13. Organized a petition (including online petitions) for an environmental cause.	.47	.98	.62	1.02	1.06	1.29	.97
14. Consciously made time to be able to work on environmental issues (e.g., working part time to allow time for environmental pursuits, working in an environmental job, or choosing environmental activities over other leisure activities).	1.22	1.34	.80	−.15	1.26	.78	.69
15. Participated in a community event which focused on environmental awareness.	1.48	1.33	.77	−.44	1.19	.75	.69
16. Organized a community event which focused on environmental awareness.	.62	1.08	.76	.67	1.20	.81	.59
17. Participated in nature conservation efforts (e.g., planting trees, restoration of waterways).	1.57	1.38	.71	−.55	1.12	.95	.91
18. Spent time working with a group/organization that deals with the connection of the environment to other societal issues such as justice or poverty.	1.35	1.41	.71	−.30	1.02	1.07	1.17

describing environmental activities as well as other scales were also included as part of this survey package, but they are not relevant to the current analysis.

### 3.2.4. Environmental identity scale

The Environmental Identity Scale (Clayton, 2003) is a 12-item scale which measures a personal feeling of connection with the natural world (Clayton, 2003). Items such as “I think of myself as part of nature, not separate from it” were rated on a 1 (not true of me at all) to 7 (completely true of me) scale. Past research has supported the relationship of environmental identity with eco-centrism, universal values, environmental behaviors, environmental decision-making (Clayton, 2003), and environmental activism (Matsuba et al., 2012). Cronbach's alpha in the present study (total sample, containing all participants) was .86.

## 3.3. Results and discussion

### 3.3.1. Scale properties

The final 18-item version of the scale was examined to assess its factor structure and to establish its reliability and validity. The mean EAS score was computed for participants across all 18 items. The mean response on the final scale was 1.29 (range = 0 to 3.89, SD = .75). The distribution was slightly skewed towards the right (.87, SE = .15) with negligible kurtosis (.39, SE = .29). Means for the individual items were between .30 (item 7) and 2.93 (item 4). Most items, especially those representing the scale extremes, were significantly non-normally distributed. Retained items, means,

standard deviations, and item–total correlations are shown in Table 1.

### 3.3.2. Reliability

Internal consistency of the EAS was evaluated using elements of CTT analyses and Rasch measurement. Coefficient alpha for the EAS scale was high, at .92. Item–total correlations were between .43, and .80.

Results from application of the Rasch model to the data for each EAS respondent are also found in Table 1. Items were relatively evenly distributed across the scale with difficulty scores ranging from a low of −1.98 (item 4, *talked with others*) to .67 (item 16, *organized a community event*) on a logit scale. In this case, lower scores mean that people with a lower level of engagement are more likely to endorse this item with a high rating. Generally, items fitting well with the Rasch rating scale model will have Mean Square (MNSQ) fit statistics between .6 and 1.4 (Linacare & Wright, 1994). In this case, all items fall within this range with the exception of items 1, and 12, which are slightly above 1.4 (1.77 and 1.74 MSNQ respectively for the outfit index and 1.65 MSNQ for item 12 on the infit index). Item 1 also had the lowest discrimination index (.63), which indicates that this item is the least likely to contribute to the discrimination between those engaged in environmental action and those who are not, which is not surprising given that it is an entry level action.

The person-item map (see Fig. 1) suggests that the items are well aligned along the range of possible levels of engagement and that there is little redundancy in the items in regard to the information



Fig. 1. Person map of items.

they contribute for the overall scale score. This map also indicates that the scale is especially good in assessing and differentiating people at the mid-levels of engagement. The dimensionality map indicates that 62.0% of the raw variance is explained by the measure, suggesting that the overall primary dimension of environmental engagement is well represented by the scale but there may also be some additional secondary dimensions as confirmed by the factor analysis reported below.

3.3.3. Validity

Confirmatory factor analysis (CFA) using maximum likelihood estimation was conducted using AMOS 20 (SPSS, 2011) to evaluate the proposed structure of two sub-factors, one reflecting environmental leadership actions, and one representing participatory civic actions, both loading onto a general engagement factor representing the primary dimension (See Fig. 2). To prevent an under-identified model, the loading of one item on each factor was

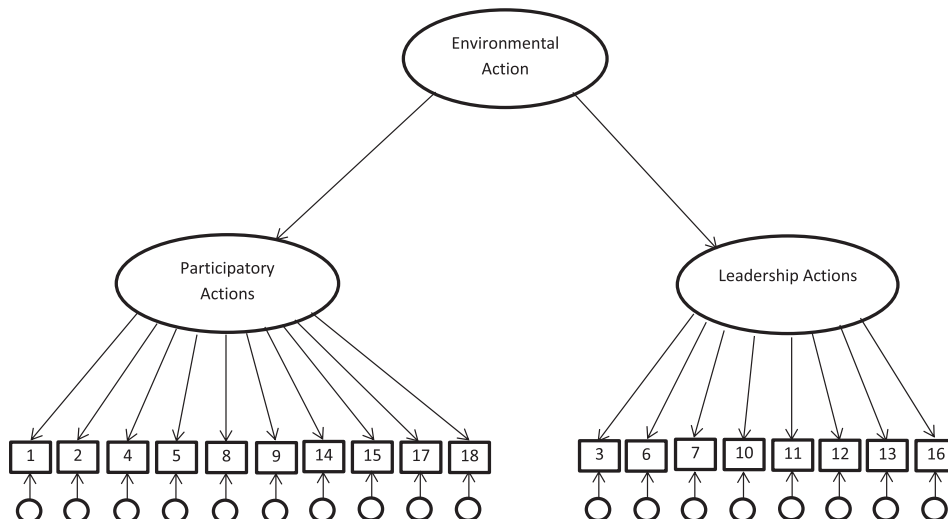


Fig. 2. Confirmatory factor analysis of proposed factor structure.

constrained to be one, the loadings of these secondary factors onto the general environmental factor were constrained to be equal, and the variance of the general factor was constrained to be 1. Items 2 and 3 were conceptually similar, as were items 15 and 16, so the errors for these item pairs were allowed to co-vary in this analysis (Kline, 2005).

In testing for the normality assumption, the multivariate normality critical ratios were greater than 10.0 indicating significant non-normality of the data, so each model was reran using a bootstrapping method to obtain a Bollen–Stine corrected probability ( $p$ ) value. This approach allows for estimating standard errors without making distributional assumptions (Chernick, 1999). The number of bootstrap samples drawn for each analysis was set to 200. Researchers have proposed cut-offs for good model fit of a relative chi-square of less than 2 or 3 (Kline, 2005), RMSEA of less than .08 (Hu & Bentler, 1995), and CFI of greater than .93 (Byrne, 1994). The CFA for the proposed hierarchical model, with one general environmentalism factor and two subfactors suggested that the proposed structure was a relatively good fit for the data, ( $\chi^2 = 329.55$ ,  $df = 132$ ;  $\chi^2/df = 2.50$ ; Bollen–Stine bootstrap  $\chi^2 p = .005$ ; CFI = .90; RMSEA = .07), with only of the indices slightly below the proposed minimum value. In comparing a variety of alternative models (e.g., a simple one-factor model) this factor structure clearly emerged as the superior fit with the data.

These results support the proposed scale structure of two factors, one comprised of items assessing active environmental leadership, and one representing participation. The standardized estimates of the factor loadings of the two secondary factors onto the general environmental engagement factor were high; the standardized estimate for “leadership actions” was .71, and the standardized estimate for “participatory actions” was 1.20. The standardized estimates of the factor loadings of the items on the two secondary factors were between .37 and .83 (see Table 2).

Convergent validity was assessed by comparing the scores on the EAS with scores on other measures, which have been shown to be related to environmental activism. Scores on the EAS were significantly correlated with Environmental Identity ( $r = .36$ ,  $p < .001$ ) and with self-rated interest in the environment ( $r = .49$ ,  $p < .001$ ).

Analyses of the scale's concurrent validity focused on the sample of environmental activists. This sample was actively interested in the environment ( $M_{\text{environmental interest}} = 4.83$ , range = 4–5;

$SD = .38$ ) and strongly identified with the natural world ( $M_{\text{environmental identity}} = 1.53$ ,  $SD = .39$ ). The mean EAS score was 2.07 ( $SD = .74$ ). A  $t$ -test comparison indicated that the environmental activist sample scored significantly higher than the international validation sample on the EAS ( $t = 3.46$ ,  $df = 297$ ,  $p < .01$ ;  $d = .41$ ), supporting the concurrent validity of the scale.

We expected that the mean EAS score would be related to but distinct from the mean score of the four personal practice behavior items. While many who engage in environmental actions would very likely engage in these types of behaviors, these behaviors may also be motivated by a variety of non-environmental reasons such as financial savings and social norms and do not represent a form of environmental action as defined in this article. The relatively moderate correlation of  $r = .34$  ( $p < .05$ ), confirms our expectation and supports the discriminant validity of the scale.

#### 4. Discussion and conclusions

Our goal with developing the EAS was to provide a comprehensive and psychometrically sound scale that assesses the level of engagement in environmental actions. Our hope is that such a scale will contribute to the empirical evaluation of approaches and programs intended to foster environmental actions, which we defined as intentional and conscious civic behaviors that are focused on systemic causes of environmental problems and the promotion of environmental sustainability through collective efforts. Based on the literature review, we consider these actions to be qualitatively distinct from personal practices (e.g., green consumerism), which was confirmed in our empirical study. Programs that focus on fostering environmental actions are often very different in nature compared to campaigns promoting changes in personal practice. The former often focus on root causes and community and political participation, include participatory activities related to raising critical consciousness, foster system thinking, and promote action competence, and rely on smaller group processes such as peer mentorship (Jensen & Schnack, 1997; Dittmer & Riemer, 2013; Riemer et al., 2013). Personal practice campaigns and strategies, on the other hand, tend to focus more on one or two specific behaviors that are targeted with specific manipulations derived mostly from social psychology experiments and targeted often at a large group of people simultaneously (McKenzie-Mohr, 2011). In many cases such behavioral manipulations do not require specifically environmental intentions but could be based on other motives such as personal health, monetary incentives, or social norms. People engaged in environmental actions on the other hand tend to have a strong environmental identity suggesting that the environment plays a more central role in their lives and serves as a general driver for their action (Clayton, 2003; Matsuba et al., 2012; Whitmarsh & O'Neill, 2010). It is therefore prudent to evaluate these qualitative different approaches to engaging people in environmentally focused change with different types of scales. Our conceptual considerations and empirical analyses provide support to that assertion.

Our psychometric evaluations also confirm our conclusions from the literature review that environmental actions can be measured on one continuous dimension ranging from low-intense citizenship behaviors to very involved political leadership actions. But, the two secondary sub-factors that emerged also lend support to those who believed that there are some relevant differences between leadership actions and more participatory or supportive actions. While the leadership actions tend to cluster at the upper end of the scale, the secondary dimension suggests that the differences are more than just a matter of level. As such, the resulting factor structure of one primary with two secondary sub-factors could provide some conceptual and empirical clarity regarding

**Table 2**  
Factor loadings, variance accounted for and eigen values.

Item	Standardized loadings	
	Participatory actions	Leadership actions
1.	.37	
2.	.63	
4.	.46	
5.	.53	
8.	.82	
9.	.51	
14.	.83	
15.	.77	
17.	.71	
18.	.70	
3.		.62
6.		.53
7.		.64
10.		.70
11.		.70
12.		.42
13.		.66
16.		.80
Loading on environmental action	1.20	.71

the categorization and measurement of environmental actions.

Based on our earlier literature review and our findings we expect that scores on the EAS are related to Environmental Identity (Clayton, 2003), action competence, self-efficacy beliefs related to action competence, collective efficacy beliefs as well as social and contextual factors such as friends who are also engaged in environmental actions. Future research will be able to provide some additional insight into this. For example, in a recently completed multi-national study evaluating a program intended to engage youth in environmental actions that relies on the promotions of such determinants of environmental action (e.g., connection to a local person with personal experience of environmental injustice, environmental participation in action projects, peer facilitators, and links with a local environmental organizations) we found that the EAS was sensitive to change over time (assessments were done at baseline and after 3, 6 and 12 months) and differentiated between those who participated in the program and a comparison group (Authors).

In conclusion, the present evaluation of the EAS is encouraging. The scale shows strong psychometric properties and appears to be a reliable and valid measure of environmental actions that correspond with our theoretical conceptualization. The EAS can be used by researchers to empirically assess changes in environmental engagement over time and for creating a strong evidence-base for strategies and programs targeted at environmental actions.

Despite the rigorous testing described above, we anticipate that in the future, it will be necessary to periodically evaluate the scale items in terms of the changing face of environmental action; for example, as technology changes, we anticipate that environmental actions may change to incorporate new technologies. Also, we acknowledge that the process of engaging in environmental action is highly complex and includes a vast variety of possible behaviors, which makes it challenging to be assessed adequately with a general and relatively short quantitative scale. However, the empirical findings reported in this paper do suggest that general trends of engagement in environmental actions can be captured by using the EAS.

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## References

- American Psychological Association. (2010). *Psychology & global climate Change: Addressing a multifaceted phenomenon and set of challenges*. A Report of the American Psychological Association Task Force on the Interface Between Psychology & Global Climate Change. Downloaded from <http://www.apa.org/science/about/publications/climate-change.aspx>. November 23, 2010.
- American Psychological Association (no date). Retrieved from <http://www.apa.org/research/action/glossary.aspx?tab=1>.
- Andrich, D. (1998). A rating formulation for ordered response categories. *Psychometrika*, 43, 561–573.
- Byrne, B. M. (1994). *Structural equation modeling with EQS and EQS/Windows*. Thousand Oaks, CA: Sage Publications.
- Chernick, M. R. (1999). *Bootstrap methods: a practitioner's guide*. New York: John Wiley & Sons.
- Clayton, S. (2003). Environmental identity: A conceptual and an operational definition. In S. Clayton, & S. Opatow (Eds.), *Identity and the natural environment* (pp. 45–65). Cambridge, MA: MIT Press.
- DeVellis, R. F. (2003). Scale development: Theory and applications (2nd ed.). In *Applied social research methods series* (2nd ed.), (Vol. 26). Thousand Oaks, CA: Sage.
- Dietz, T., Stern, P. C., & Guagnano, G. A. (1998). Social structural and social psychological bases of environmental concern. *Environment and Behavior*, 30(4), 450–471.
- Dittmer, L. D., & Riemer, M. (2013). Fostering critical thinking about climate change: applying community psychology to an environmental education project with youth. *Global Journal of Community Psychology Practice*, 4(1). Available electronically at <http://www.gjcpp.org/en/>.
- Dono, J., Webb, J., & Richardson, B. (2010). The relationship between environmental activism, pro-environmental behaviour and social identity. *Journal of Environmental Psychology*, 30(2), 178–186.
- Gifford, R. (2008). Psychology's essential role in alleviating the impacts of climate change. *Canadian Psychology*, 49(4), 273–280.
- Harré, N. (2011). *Psychology for a better world*. Auckland: Department of Psychology, University of Auckland. Downloaded from <http://www.psych.auckland.ac.nz/psychologyforabetterworld>. February 26, 2012.
- Hegarty, K., Thomas, I., Kriewaldt, C., Holdsworth, S., & Bekessy, S. (2011). Insights into the value of a 'stand-alone' course for sustainability education. *Environmental Education Research*, 17(4), 451–469.
- Hu, L. T., & Bentler, P. M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues and applications* (pp. 76–99). Thousand Oaks, CA: Sage.
- Jensen, B. B., & Schnack, K. (1997). The action competence approach in environmental education. *Environmental Education Research*, 3(2), 163–178.
- Kenis, A., & Mathijis, E. (2012). Beyond individual behavior change: the role of power, knowledge and strategy in tackling climate change. *Environmental Education Research*, 18(1), 45–65.
- Kline, R. B. (2005). *Principles and practice of structural equation modeling*. NY: Guilford Press.
- Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8, 239–260.
- Leiserowitz, A., Maibach, E., Roser-Renouf, C., Feinberg, G., & Howe, P. (2012). *Americans' actions to limit global warming in September 2012*. New Haven, CT: Yale University and George Mason University. Yale Project on Climate Change Communication <http://environment.yale.edu/climate/publications/Behavior-September-2012/>.
- Linacre, J. M. (2014). *WINSTEPS® 3.81.0 [Computer software]*. Retrieved from <http://www.winsteps.com/index.htm>.
- Linacre, J. M., & Wright, B. D. (1994). Chi-square fit statistics. *Rasch Measurement Transactions*, 8(2), 350.
- Lubell, M. (2002). Environmental activism as collective action. *Environment and Behavior*, 34, 431–454.
- Matsuba, M. K., Pratt, M. W., Norris, J., Mohle, E., Alisat, S., & McAdams, D. (2012). Environmentalism as a context for expressing identity and generativity: Patterns among activists and uninvolved youth and midlife adults. *Journal of Personality*, 80(4), 1091–1115.
- McKenzie-Mohr, D. (2011). *Fostering sustainable behavior: An introduction to community-based social marketing*. Gabriola Island, BC, Canada: New Society Publishers.
- Ockwell, D., Whitmarsh, L., & O'Neill, S. (2009). Reorienting climate change communication for effective mitigation: forcing people to be green or fostering grass-roots engagement? *Science Communication*, 30(3), 305–327.
- Riemer, M., Athay, M. M., Bickman, L., Breda, C., Kelley, S. D., & Vides de Andrade, A. R. (2012). The peabody treatment progress battery: history and methods for developing a comprehensive measurement battery for youth mental health. *Administration and Policy in Mental Health and Mental Health Services Research*, 39(1–2), 3–12.
- Riemer, M., & Kearns, M. A. (2010). Description and psychometric evaluation of the youth counseling impact scale. *Psychological Assessment*, 22(10), 259–268.
- Riemer, M., Lynes, J., & Hickman, G. (2013). Engaging youth in environmental change. A model for developing and assessing youth-based environmental engagement programmes. ahead of print *Journal of Environmental Education Research*, 1–23.
- Riemer, M., & Schweizer-Ries, P. (2012). Psychology and sustainability science: complexity, normativity, and transdisciplinarity in meeting sustainability challenges. *Umweltpsychologie*, 16(1), 143–165.
- Rouser-Renouf, C., Maibach, E. W., Leiserowitz, A., & Zhao, X. (2014). The genesis of climate change activism: from key beliefs to political action. *Climatic Change*, 125, 163–178.
- Rubbishfree (no date). About us. Retrieved from [http://www.rubbishfree.co.nz/information.php/info\\_id/98](http://www.rubbishfree.co.nz/information.php/info_id/98).
- Schafer, J. L., & Olsden, M. K. (1998). Multiple imputation for multivariate missing-data problems: a data analyst's perspective. *Multivariate Behavioral Research*, 33, 545–571.
- Séguin, C., Pelletier, L. G., & Hunsley, J. (1998). Towards a model of environmental activism. *Environment and Behavior*, 20(5), 628–652.
- Smith, E. V., Jr., & Smith, R. M. (2004). *Introduction to Rasch measurement*. Maple Grove, MN: JAM Press.
- Snow, D. A., Rochford, E. B., Worden, S. K., & Benford, R. D. (1986). Frame alignment processes, micromobilization and movement participation. *American*

- Sociological Review*, 51, 464–481.
- SPSS Inc. (2011). *Amos (Version 20.0) [Computer program]*. Chicago: SPSS.
- Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407–424.
- Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., & Kalot, L. (1999). A value-belief-norm theory of support for social movements: the case of environmentalism. *Research in Human Ecology*, 6(2), 81–97.
- Tindall, D. B., Davies, S., & Mauboules, C. (2003). Activism and conservation behavior in an environmental movement: the contradictory effects of gender. *Society & Natural Resources*, 16(10), 909–932.
- Willis, G. B. (1999). "Cognitive interviewing: A 'How to' guide". *reducing survey error through research on the cognitive and decision process in surveys*. Short course presented at the 1999 Meeting of the American Statistical Association. (Rachel A. Caspar, Judith T. Lessler, and Gordon B. Willis – Research Triangle Institute.) Downloaded from <http://appliedresearch.cancer.gov/areas/cognitive/interview.pdf> on November 6, 2011.