

Environmental Concern and the Dimensionality Problem: A New Approach to an Old Predicament*

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Objective. Much previous work in the field of survey research has puzzled over modest bivariate correlations between different environmental measures, suggesting that public attitudes on the environment are rather crude, disconnected, and narrowly focused. Using 1991 Gallup data, the purpose of this research is to present a methodological critique and reevaluation of the literature on the dimensionality of environmental concern. *Methods.* Given the frequent, yet problematic, use of environmental batteries that ask respondents to express opinions using a common response format, this paper uses confirmatory factor analysis to correct for both random and nonrandom sources of measurement error. *Results.* Data results suggest that not only can the standard environmental battery used by Gallup be reduced to relatively few latent factors, those factors are themselves strongly correlated across a diverse set of environmental issues, as well as among several broad idea elements thought to define environmental concern. *Conclusions.* While current results offer compelling evidence of the near unidimensionality of environmental attitudes, and of the willingness of many Americans to express concern for environmental quality, ultimately dimensionality alone may be insufficient proof that public attitudes on the environment have matured into a sophisticated and constrained social paradigm or belief system.

Over the past two decades, environmental opinion has often been portrayed at best as fragmented and issue specific and at worst as a veritable crazy quilt of conflicting ideas and desires. Survey researchers, for example, have long puzzled over modest bivariate correlations between various measures of environmental concern, while others have

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used this possible "multidimensionality" to suggest that Americans may be unwilling to face the hard choices an environmental ethic requires. Such conclusions, however, create an odd paradox for those who view growing environmental consensus as a redefinition of basic social values. As Rosenbaum (1991) argued, strong pro-environmental attitudes across all segments of the U.S. population over the past twenty-five years seem to reveal "an ongoing transformation in the American public's beliefs about how the world works physically, socially, economically, and politically" (p. 305). Yet, if everyone is indeed "an environmentalist these days" (Schneider, 1990), why should various survey instruments appear so idiosyncratic?

In part, the answer could be one of faulty survey design. Perhaps lenient questionnaires too readily encourage respondents to proclaim themselves environmentalists, only to back away from environmental goals when trade-offs and behavioral commitments are brought to mind.¹ Data suggest, for example, that while many Americans are sympathetic to environmental problems, most remain unwilling to act on their stated environmental beliefs either as voters, consumers, or political activists (Dunlap 1987, 1989, 1991a; Schwartz and Miller, 1991). This continued "gap" between environmental attitudes and behavior is consistent with the criticism that Americans lack a strong underlying orientation toward the environment, and that surveys that purport to measure environmental attitudes find little more than "doorstep opinions" conditioned by social desirability.

Second, the reason could lie in the structure of environmental opinion itself. It may be reasonable, although perhaps not wholly logical, for respondents to support government policies on issues they care little for, or to feel concern for one environmental issue without being swayed by others that fall under the environmental rubric. In other words, environmental attitudes could be truly multidimensional, "splintered into a number of separate and narrowly focused belief systems," where individual issues are dealt with in terms of particular symbols and reference points (deHaven-Smith, 1989:630).

Finally, in debating the question of dimensionality, perhaps the right questions have simply not been asked of the data. If, for example, we have reason to believe that some environmental belief system exists and that our measures are merely indicators of that underlying construct, moderate or even low bivariate correlations may be insufficient

¹Sterngold, Warland, and Herrmann (1994) argued, for example, that the standard degree-of-concern survey item (e.g., "How concerned are you about . . .?") inflates concern for subjects such as the environment by presupposing some level of concern. One way to reduce this effect, they argued, is to first ask a filter question to determine if respondents are concerned about a topic, followed by some measure of degree or intensity. Unfortunately, most surveys focusing on environmental issues fail to do so.

proof of multidimensionality. Indeed, correlations between latent traits of interest may bear little resemblance to those between observed indicators, especially if errors in measurement are suspected (Blalock, 1965, 1969, 1970; Achen, 1975; Green, 1988; Green and Citrin, 1994).

In this paper I present a methodological critique and reevaluation of the literature on the dimensionality of environmental concern. In examining data from a 1991 national Gallup poll, I look first at the relationship between different substantive issues relating to the environment (e.g., air pollution, global warming, and so on), and second at correlations between conceptually different idea elements thought to define "environmental concern," such as the perceived seriousness of environmental problems, self-identification as an environmentalist, and pro-environmental behavior.

The Dimensionality Problem Defined

The first generation of articles on environmental attitudes began to appear in academic journals soon after Earth Day in 1970. Because the field was new and because survey researchers were developing questionnaires independently and administering them locally, they tended to use environmental measures which were very different. While some studies measured attitudes toward specific environmental issues, such as pollution, population control, or natural resources (Tognacci et al., 1972), others attempted to aggregate preferences into a single universal measure of "environmental concern" (Buttel and Flinn, 1976; Maloney, Ward, and Braucht, 1975). Some researchers concluded that perceptions of the seriousness of environmental problems represented a valid indicator of concern (Buttel and Flinn, 1976), while others chose support for government spending (Dillman and Christenson, 1972; Marsh and Christenson, 1977), knowledge about environmental issues (Maloney et al., 1975), support for policy reform (Buttel and Flinn, 1976; Buttel and Johnson, 1977), or self-reported involvement in "environmentally friendly" activities, such as recycling and energy conservation (Dunlap et al., 1983; Milbrath, 1984; Schwartz and Miller, 1991).

Most early studies, however, tended to treat such diverse subjects as indicators of the *same* underlying construct, broadly termed "concern for environmental quality," or simply "environmental concern." Since the late 1970s a second generation of published articles has noted, and struggled with, modest bivariate correlations between these measures, drawing considerable attention to issues of measurement, and finally to the question of dimensionality itself. In short, as Van Liere and

Dunlap (1981) asked, "does it make a difference how environmental concern is measured?" (p. 652).

For most researchers, the answer has been a resounding "yes." In fact, many argue that environmental attitudes are "multidimensional" and issue specific, and that the same underlying construct is not being "tapped" in each case (Buttel and Johnson, 1977; Lounsbury and Tornatzky, 1977; Van Liere and Dunlap, 1981; Albrecht, Bultena, Hoiberg and Nowak, 1982; Keeter, 1984; Geller and Lasley, 1985). For example, while Tognacci et al. (1972) found moderately high bivariate correlations (Pearson's r 's ranging from .53 to .81) among five additive scales and Van Liere and Dunlap (1981) found strong inter-correlations between certain substantive types of environmental issues, a majority of studies have suggested that environmental items factor into two or more distinct dimensions. Lounsbury and Tornatzky (1977) cluster analyzed 78 environmental attitude items, finding three dimensions only moderately correlated with one another, while Van Liere and Dunlap (1981) added that "different theoretical conceptualizations of environmental concern are not highly intercorrelated" (p. 658). In addition, Buttel and Johnson (1977) examined a sample of 32 Wisconsin community elites and found that five measures loaded onto two factors, each with distinct socioeconomic correlates.

Broader studies attempting to quantify a "paradigm shift" more sensitive to environmental values have reached a similar impasse. In noting a change in social values toward "environmentalism," for example, Dunlap and Van Liere (1978, 1984) and Milbrath (1984) elaborated a paradigmatic shift away from a "dominant social paradigm" (DSP) of widely shared values in society that had centered around belief in abundance and progress, devotion to growth and prosperity, faith in science and technology, and a commitment to a *laissez-faire* economy. Concern with recent environmental trends, they concluded, has undermined the assumptions of the DSP, shifting social norms toward a "new environmental paradigm" (NEP) that comes to grips with limits to growth, the balance of nature, and the finite availability of natural resources (Pirages and Ehrlich, 1974; Catton and Dunlap, 1978; Dunlap and Van Liere, 1978; Milbrath, 1984).

Using principal factor analysis on a small data set of Washington State households, Dunlap and Van Liere (1978) demonstrated the unidimensionality of their 12-item NEP scale, arguing that the scale is both a valid and reliable indicator of mass acceptance of the "new environmental paradigm." Unfortunately, several attempts to replicate the same factor structure have failed. First, in using identical measures on two additional Iowa samples, Albrecht et al. (1982) concluded that the items are not unidimensional, but rather load onto three distinct dimensions they identified as "Balance of Nature," "Limits to

Growth," and "Man over Nature." Second, using confirmatory factor analysis, Geller and Lasley (1985) confirmed neither factor structure, instead arguing for a 3-factor, 9-item model, truncated from the original. Still other more recent attempts have asserted that the scale factors into two, three, or even four dimensions (Pierce, Lovrich, and Tsurutani, 1987; Kuhn and Jackson, 1989; Noe and Snow, 1990; Scott and Willits, 1994).

Finally, given countless studies that underscore the multidimensionality of environmental concern, some students of mass belief systems have gone one step further, viewing multidimensionality as lack of constraint, thereby suggesting that public attitudes toward the environment are not rooted in abstract philosophical or ideological principles, but are rather crude and disconnected, "splintered into a plethora of narrowly focused perspectives" (deHaven-Smith, 1988, 1989, 1991). If accurate, such an interpretation challenges not only the validity of many environmental measures, but also the very existence and utility of a concept broadly termed "environmental concern."

Methodological Considerations

While previous research has supported the multidimensionality of environmental concern, the methodology of much of this work is problematic. My analysis in this paper seeks to improve upon past efforts in several important respects.

Sampling Limitations. First, with the exception of the NEP scale and its many replications, most researchers have used independent question wording that hinders direct comparison. In addition, the samples used in most published studies have been small, regionally based, and self-administered through the use of mail surveys (for example, Dunlap and Van Liere, 1978; Van Liere and Dunlap, 1981; Kuhn and Jackson, 1989; Scott and Willits, 1994). In this study, I use a battery of environmental questions drawn from a 1991 national Gallup survey. Not only does this data set provide a well-drawn national sample, avoiding the self-selection bias found in most mail surveys, but most measures were repeated in identical wording and format in both 1989 and 1990, allowing for replication.

Confirmatory Factor Analysis. Second, the statistical techniques employed in most previous studies include only bivariate correlations and/or exploratory factor analysis. While exploratory factor analysis can be a useful tool in deciphering possible patterns and relationships in the data, confirmatory factor analysis (CFA) is superior in that it tests

latent sources of variation and covariation based upon a priori information about the structure of environmental beliefs. CFA is also appropriate in this case because it allows questions of reliability and validity, so central to the issue of dimensionality, to be integrated into model development, estimation, and interpretation (Hayduk, 1987).

Measurement Error. Finally, in most previous studies, as in this one, batteries of measures on environmental issues are used where questions are asked in close proximity using the same response format (see, for example, Dunlap and Van Liere [1978] and Geller and Lasley [1985]). In cases such as this, it is reasonable to suspect correlated errors of measurement, a possibility that cannot be accommodated using exploratory factor analysis.²

While random errors in measurement tend to attenuate correlations between measures, nonrandom errors can occur if respondents tend to "anchor" themselves along the response continuum and then answer subsequent questions relative to this personal reference point (Green and Citrin, 1994). Under these conditions, the effect is more unpredictable. Covariance algebra indicates that correlations contaminated by systematic response bias (or positive error covariance) can be either *larger* or *smaller* than the true correlation, and may even be of the wrong sign (Blalock, 1965, 1969, 1970; Asher, 1974, Achen, 1975; Green, 1988; Green and Citrin, 1994).

Under some conditions, therefore, it is possible for measurement error to cause attitudes to *appear* multidimensional when in fact the relationship between latent traits is much different. Conversely, strong correlations observed between certain measures may be due to their close proximity and common response format, rather than to their "true" underlying relationship. Once again, confirmatory factor analysis is ideally suited to examining the measurement properties of variables under these difficult conditions because it is flexible enough to allow different sources of error to be estimated and controlled.

Data Analysis

As Van Liere and Dunlap (1981) maintained, the dimensionality problem is essentially twofold. The first issue, they argued, addresses the consistency of responses across different substantive environmental issues. If a respondent is concerned about air pollution, for example, are they likely to feel concern for other environmental issues as well,

²The term "measurement error" is used here to refer to a variety of measurement problems: errors in coding, idiosyncratic interpretation of questions from respondent to respondent, and the inability of some respondents to communicate their views accurately given the crudeness of the response categories presented (Green and Citrin, 1994: 261n).

such as water pollution, acid rain, and global warming? The second question regarding the dimensionality of environmental attitudes is much broader, and potentially more important, describing the relationship between different idea elements, or "theoretical conceptualizations," thought to define environmental concern, such as the perceived seriousness of environmental problems, self-identification as an environmentalist, and pro-environmental behavior.

From a methodological standpoint understanding inconsistency across various expressions of environmental concern is important for several reasons. First, if these measures are largely independent constructs, it becomes difficult to assess the strength of personal commitment to environmental goals, and to conclude which measure provides the best approximation of "true" environmental attitudes. Moreover, for survey researchers who look to multiple indicators to improve reliability, such reasoning questions whether valid measures can ever be found.

Second, if these constructs are largely unrelated, it suggests that respondents are indecisive and inconsistent with respect to key components of the environmental movement. A respondent may be concerned with environmental problems, but not act on their beliefs, or they may think and act as an environmentalist and yet fail to identify with the broader environmental movement. This issue goes to the heart of questions surrounding the development of a constrained environmental belief system in the United States.

Selection of Variables. In order to examine the strength of environmental attitudes and the degree to which Americans regard the environment as a serious national problem, data on environmental concern were obtained from a 1991 national Gallup poll.³ Within a lengthy battery of environmental questions, respondents were asked whether they personally worry "a great deal," "a fair amount," "only a little," or "not at all," about 11 different environmental issues, ranging from air and water pollution to ozone depletion, global warming, and acid rain. Descriptive statistics for these 11 measures appear in Table 1.

In addition, respondents were asked to report whether they "try to improve the quality of the environment" by participating in a number of environmentally friendly activities, such as contributing money to environmental groups, reducing household energy use, or purchasing

³The data used in this paper were drawn from a national Gallup poll (GO-122025). Interview dates for the survey were 11-14 April 1991 and the sample size was 1,007 adults nationwide. All interviews were conducted by telephone using a random digit stratified probability design that allows for the inclusion of both listed and unlisted telephone numbers.

TABLE 1
Descriptive Statistics for 11 Measures of Environmental Concern

	Mean	Standard Deviation	Skewness	Kurtosis	"Not at all" (1)	"Only a little" (2)	"A fair amount" (3)	"A great deal" (4)
*Ocean and beach pollution	3.28	0.90	-1.02	0.01	5.3%	14.4%	27.0%	53.2%
Pollution of rivers, lakes, and reservoirs	3.54	0.73	-1.53	1.64	1.9	8.7	22.9	66.6
*Air pollution	3.44	0.77	-1.26	0.93	2.4	9.7	29.4	58.4
*Damage to the earth's ozone layer	3.16	0.97	-0.84	-0.47	7.8	17.1	26.0	49.1
*The loss of tropical rain forests	3.04	1.01	-0.64	-0.80	9.4	20.2	27.2	43.1
The loss of natural habitat for wildlife	3.29	0.89	-1.05	0.14	5.1	13.4	28.7	52.8
*The "greenhouse effect" or global warming	2.90	1.04	-0.46	-1.01	12.3	22.2	28.7	36.8
Contamination of soil and water by toxic waste	3.42	0.84	-1.30	0.70	3.7	12.1	22.3	61.9
Contamination of soil and water by radioactivity from nuclear facilities	3.01	1.03	-0.58	-0.93	10.2	21.8	25.2	42.8
*Acid rain	2.89	1.02	-0.49	-0.92	12.4	20.8	31.9	34.9
Pollution of drinking water	3.50	0.78	-1.45	1.15	2.4	10.9	20.8	65.9
Number of cases = 900								

SOURCE: Gallup (GO-122025), 11-14 April 1991. Listwise deletion of missing values has been used throughout.

NOTE: Items selected for confirmatory factor analysis are denoted with asterisks.

products because of their environmental attributes. Finally, respondents were asked by Gallup if they thought of themselves as an environmentalist or not. Those that considered themselves to be an environmentalist were then probed as to whether they felt they were a "strong environmentalist" or "not a strong environmentalist."

While this original battery of environmental measures includes many diverse issues and activities, a subset of variables were selected for inclusion in this analysis with two goals in mind.

First, in order to test the dimensionality of environmental concern, uni- and multidimensional models had to be formulated on the basis of prior theoretical expectations.⁴ For example, measures of concern for air and water pollution and acid rain can most likely serve as valid indicators of a general orientation toward environmental pollution, while issues surrounding ozone depletion, deforestation, and the "greenhouse effect" can in all likelihood represent a broad concern for global environmental problems. Some measures, however, such as concern for toxic waste, nuclear contamination, and loss of wildlife habitat, were excluded from analysis because they seemed to tap considerations that were significantly different from either latent trait. Measures of environmental behavior were likewise reduced to three broad groups reflecting political activism, conservation efforts, and "green" consumer behavior.⁵

Second, given the importance of test statistics in discriminating between competing factor analytic models, variables with degrees of non-normality severe enough to cause potential problems were excluded from consideration (e.g., pollution of rivers, lakes and reservoirs, and pollution of drinking water). Here it is important to note that maximum likelihood (ML) estimation in CFA requires certain distributional assumptions, including the multinormality of observed variables. Non-normality in the form of excessive skewness or kurtosis can threaten the validity of significance tests and goodness-of-fit statistics, such as

⁴As a preliminary step toward model specification principal factor analysis was used on the full set of Gallup items. Using a scree plot, eigenvalues dropped sharply after extracting the first factor and evened out in consecutive factors, with the first factor explaining 51 percent of the total variance in all variables. While high factor loadings for these 11 items looked promising as evidence of near perfect unidimensionality, ranging in value from .65 to .75, such results are at best inconclusive, and at worst misleading. Given that all 11 items were asked in close proximity using an identical response format, it is possible that this common response format drives the high factor loadings observed. In order to purge estimates of this systematic response bias, confirmatory factor analysis must be used. Results from this preliminary analysis may be obtained by request from the author.

⁵Only one available behavior variable was excluded from analysis ("used cloth rather than disposable diapers"), primarily because of a high number of "don't know"/not applicable responses. Using a listwise deletion of missing values, the overall sample size dropped significantly when this measure was included.

chi-square (Bollen, 1989).⁶ While it is possible to employ an alternative estimator under these conditions, such as weighted least squares (WLS), these techniques are more demanding computationally and not clearly superior in performance (Hayduk, 1987; Bollen, 1989).

Estimation of Two Measurement Models. Given joint consideration of the above criteria, six substantive environmental issues were selected for the following analysis, and these variables are distinguished by asterisks (*) in Table 1. In order to assess the relationship between these different environmental problems, the hypothesis that environmental concern is a two-factor structure consisting of traits broadly termed "perceived seriousness of environmental pollution" and "perceived seriousness of global environmental problems" will be tested against the counterhypothesis that all six measures are indicators of the same, unidimensional, construct. Because all six questions were asked using an identical response format, a measurement error covariance term is also estimated. This technique provides an effective corrective device for response set bias and allows estimated correlations between factors to be purged of possible question wording artifact.

LISREL estimates for both uni- and multidimensional models of environmental concern are detailed in Table 2 and suggest two important

⁶The data used here are also problematic because of their ordinal nature. Although Jöreskog and Sörbom (1989) recommended that a polychoric correlation matrix be used with weighted least squares (WLS) under these conditions, this technique holds no special advantage here for several reasons.

First, polychoric correlation matrices do not alleviate the normality assumptions required by LISREL. Rather, the procedure requires the assumption that the true underlying variables are distributed multivariate normally, and that the observed data appear as nonnormal only because of poor and arbitrary classification into categories. Whether that assumption holds true for most environmental data is unclear. While the measures used by Gallup in their environmental battery are negatively skewed, this may be due to poor cut points, or it may be due to a skewed underlying distribution, if Americans are indeed overwhelmingly pro-environmental. As Hayduk (1987) wrote, "If the problematic skewness really does originate from a skewed, or otherwise nonmultivariate population distribution, we might be doing more harm than good by 'rectifying' the problem" (p. 329).

Second, use of any correlation matrix as an input matrix in LISREL leads to a loss of information about the real scales on which the indicators are based, interfering with the use of goodness-of-fit statistics and test statistics, such as chi-square (Long, 1983b; Hayduk, 1987; Bollen, 1989). Moreover, because of this loss of information along the diagonal of the input matrix, use of a polychoric correlation matrix can make identification problems more severe and model convergence difficult.

Finally, a comparison of Pearson's and polychoric correlations in this case shows little difference in relative rank. True, Pearson's correlations are generally attenuated in comparison to polychoric correlations, but if what we are interested in is the rank or order of coefficients (i.e., which measures correlate more highly than others), this information remains essentially the same. Consequently, a bivariate OLS regression of Pearson's correlations on their corresponding polychoric correlations for the six measures of environmental concern used here yield a slope estimate of .93 and an R^2 of .97. For all of these reasons the use of maximum likelihood estimation is still an appropriate strategy.

TABLE 2

Confirmatory Factor Analysis of Six Measures of Environmental Concern

	Unidimensional Model	Multidimensional Model	
		Factor 1	Factor 2
<i>Factor loadings</i> (unstandardized)			
Acid rain	1.00 (0.00)	1.00 (0.00)	—
Ocean pollution	0.31 (0.11)	0.32 (0.11)	—
Air pollution	0.22 (0.12)	0.24 (0.12)	—
Ozone depletion	1.37 (0.17)	—	1.00 (0.00)
Loss of rain forests	0.72 (0.12)	—	0.53 (0.09)
Global warming	1.46 (0.18)	—	1.06 (0.12)
Factor variance	0.16 (0.04)	0.20 (0.09)	0.30 (0.06)
Factor covariance	—	0.23 (0.05)	
Correlation between factors	—	.91	
<i>Measurement error variances</i>			
Acid rain	0.54 (0.03)	0.51 (0.06)	
Ocean pollution	0.47 (0.03)	0.47 (0.03)	
Air pollution	0.27 (0.02)	0.27 (0.02)	
Ozone depletion	0.32 (0.03)	0.32 (0.03)	
Loss of rain forests	0.63 (0.03)	0.63 (0.03)	
Global warming	0.44 (0.04)	0.44 (0.04)	
Measurement error covariance	0.32 (0.03)	0.32 (0.03)	
<i>Item reliabilities</i>			
Acid rain	0.47	0.50	
Ocean pollution	0.42	0.42	
Air pollution	0.55	0.55	
Ozone depletion	0.66	0.66	
Loss of rain forests	0.38	0.39	
Global warming	0.60	0.60	
Chi-square	14.4	14.1	
Degrees of freedom	8	7	
Probability level	.072	.049	
Number of cases	909	909	

SOURCE: Gallup (GO-122025), 11-14 April 1991.

NOTE: All estimates are obtained using maximum likelihood. Standard errors appear in parentheses.

conclusions. First, although the fit of the multidimensional model is quite good (chi-square = 14.13, $p = .049$), the fit of the unidimensional model is just as strong (chi-square = 14.40, $p = .072$). Indeed, a nested chi-square difference test shows that the multidimensional model fails to provide a statistically significant improvement in fit over the unidimensional model.⁷

Second, the estimated correlation between the two latent environmental concern traits is quite impressive ($r = .91$), not merely because of the strength of its relationship, but because of its relative improvement over initial correlations between observed indicators (r 's ranging from .40 to .63). In sum, while dimensionality may be a matter of degree, it seems reasonable to conclude that the six environmental measures chosen here represent a single, unidimensional construct.

Finally, while results are not reported in tabular form here, identical models were replicated using similar Gallup surveys from 1989 and 1990.⁸ While goodness-of-fit is somewhat less impressive in both samples, correlation between factors remains very high in 1990 ($r = .95$), but comparatively weak in 1989 ($r = .48$). In neither sample, however, does the multidimensional model provide a statistically significant improvement in fit. Conclusions regarding dimensionality, therefore, do find support in previous years, albeit less decisive. Copies of these additional results may be obtained by request from the author.

A Broader Model of Environmental Concern. In addition to questioning respondents about their personal concern for a variety of environmental problems, the 1991 Gallup survey also included a series of measures on participation in pro-environmental activities, such as political activism, energy conservation, and "green" consumer behavior, as well as willingness to identify oneself as an environmentalist.⁹

⁷The unidimensional model is "nested" in the multidimensional model since it can be obtained by constraining one of the free parameters in the multidimensional model to be fixed (Long, 1983b). In this case, the unidimensional model constrains the correlation between factors to be 1. Accordingly, these two models can be compared for goodness-of-fit with the following test statistic, where $\chi^2 = \chi_1^2 - \chi_2^2$ with $df_1 - df_2$ degrees of freedom:

	<i>Chi-square</i>	<i>df</i>
Unidimensional model	14.40	8
Multidimensional model	14.13	7
	0.27	1

A chi-square of 0.27 with 1 degree of freedom is not statistically significant. Thus, relaxing the constraints of the unidimensional model does not result in a significant improvement in fit.

⁸Two additional Gallup surveys contain an environmental battery similar to that used in 1991. Interview dates for these surveys are 4-7 May 1989 (GO-89134) with a sample size of 1,239 adults nationwide and 5-8 April 1990 (GO-922007) with a sample size of 1,223. Sampling procedures remain the same.

⁹It is important to consider self-identification as an independent construct. As a point

As a final step in testing the dimensionality of public attitudes on the environment, the relationships between these broader idea elements will be examined.

In specifying this expanded model, several important changes should be noted. First, indicators of the perceived seriousness of environmental problems and pro-environmental behavior have been summed into additive scales, as shown in Table 3. This was done to avoid the use of ordinal data in LISREL whenever possible and to accept the distributional assumptions required by maximum likelihood more fully (see note 6).

Second, given that only one measure of self-identification was available in the Gallup study, it was necessary to fix the error variance of this observed indicator to a predetermined value in order to achieve model identification. Accordingly, this variable was examined using a conventional method of reliability assessment (Cronbach's alpha), and its error variance in LISREL was set to a value that would produce an equivalent reliability statistic.

As LISREL estimates in Table 4 show, correlations between these three latent factors are also quite high, relative to the simple bivariate correlations reported in Table 3. Pro-environmental behavior and self-identification, for example, correlate at .73, the perceived seriousness of environmental problems and self-identification correlate at .64, and perceived seriousness and behavior at .80. Moreover, the overall fit of this model is outstanding (chi-square = 9.82, $p = .199$).

Again, while not reported here in tabular form, equally strong correlations are obtained when similar models are estimated using the 1989 and 1990 Gallup samples.¹⁰ Clearly, as in the uni- and multidimensional models reported above, "corrected" correlations obtained using confirmatory factor analysis result in a substantially different, and more hopeful, view of the consistency of environmental attitudes across multiple measures.

Conclusion

Students of environmental opinion have long puzzled over the modest relationship between different measures of environmental concern,

of self-reference, for example, it is useful to know that a respondent "thinks of" him/herself as an environmentalist, aside from whether or not they would be independently classified as one based on their reported concern or behavior.

¹⁰This model cannot be replicated exactly on either the 1989 or 1990 Gallup samples since questions on "green" consumer behavior were not asked in 1989, while measures on conservation behavior (e.g., carpooling, reducing household energy use, etc.) were not included in 1990. Remaining available measures were used, however, with similar results. Again, copies of these additional models may be obtained by request from the author.

TABLE 3
Descriptive Statistics for Six Additive Scales

Additive Scales	Mean	Standard Deviation	Skewness	Kurtosis		
Perceived seriousness of environmental pollution	9.63	2.11	-0.82	0.02		
Perceived seriousness of global environmental problems	9.14	2.44	-0.68	-0.34		
Environmental activism	1.07	0.95	0.46	-0.77		
Conservation efforts	3.49	1.19	-0.57	-0.22		
"Green" consumer behavior	1.23	0.79	-0.43	-1.25		
Self-identification as an environmentalist	1.20	0.73	-0.32	-1.08		
<i>Correlation matrix</i>						
	X_1	X_2	X_3	X_4	X_5	X_6
Perceived seriousness of environmental pollution, X_1	1.00					
Perceived seriousness of global environmental problems, X_2	.70	1.00				
Environmental activism, X_3	.29	.34	1.00			
Conservation efforts, X_4	.33	.34	.22	1.00		
"Green" consumer behavior, X_5	.34	.38	.27	.27	1.00	
Self-identification as an environmentalist, X_6	.45	.46	.35	.28	.30	1.00
Number of cases = 779						

SOURCE: Gallup (GO-122025), 11-14 April 1991. Listwise deletion of missing data has been used throughout.

NOTE: Variables used here are as follows.

"Perceived seriousness of environmental pollution" is an additive scale created from three measures of personal concern for the following environmental problems: acid rain, ocean and beach pollution, air pollution.

"Perceived seriousness of global environmental problems" is an additive scale created from three measures of personal concern for the following environmental problems: damage to the earth's ozone layer, loss of tropical rain forests, the "greenhouse effect" or global warming.

"Environmental activism" is three-point additive scale created from three measures of environmental behavior: contributed money to an environmental group, did volunteer work for an environmental group, boycotted a company's products because of its record on the environment. All variables are dichotomous ("yes," "no").

"Conservation efforts" is a five-point additive scale created from five measures of environmental behavior: voluntarily recycled products, cut household's use of water, cut household's use of energy by improving insulation or heating or air conditioning system, replaced a "gas-guzzling" automobile with one that is more fuel efficient, cut down on the use of a car by carpooling or taking public transportation. All variables are dichotomous ("yes," "no").

"Green consumer behavior" is two-point additive scale created from two measures of environmental behavior: specifically avoided buying a product because it was not recyclable, avoided buying or using aerosol sprays. Both variables are dichotomous ("yes," "no").

"Self-identification as an environmentalist" is a measure of self-identification where 0 = "not an environmentalist," 1 = "not a strong" environmentalist, and 2 = "strong" environmentalist.

TABLE 4

LISREL Estimates of a Three-Factor Model of Environmental Concern

Additive Scales	Factor 1 Perceived Seriousness of Environmental Problems	Factor 2 Pro-Environmental Behavior	Factor 3 Self- Identification	Measurement Error Variances	Item Reliabilities
Perceived seriousness of environmental pollution	1.00 (0.00)	—	—	1.56 (0.14)	0.65
Perceived seriousness of global environmental problems	1.25 (0.06)	—	—	1.50 (0.20)	0.75
Environmental activism	—	1.00 (0.00)	—	0.67 (0.04)	0.25
Conservation efforts	—	1.20 (0.13)	—	1.09 (0.06)	0.23
"Green" consumer behavior	—	0.88 (0.09)	—	0.44 (0.03)	0.28
Self-identification as an environmentalist	—	—	1.00 (0.00)	*0.16 (0.00) ^a	0.71
<i>Factor variance/covariance matrix</i>					
Perceived seriousness of environmental problems	2.88 (0.24)				
Pro-environmental behavior	0.65 (0.07)	0.22 (0.04)			
Self-identification	0.67 (0.06)	0.21 (0.02)	0.38 (0.03)		
	[<i>r</i> = .80]	[<i>r</i> = .73]			
	[<i>r</i> = .64]				
Chi-square = 9.82; degrees of freedom = 7; probability level = .119; number of cases = 779					

SOURCE: Gallup (GO/1-1/122025) 11-14 April 1991.

NOTE: All estimates are obtained using maximum likelihood. Standard errors appear in parentheses.

^aThe error variance for this observed indicator is fixed so that its reliability is equivalent to its Cronbach's alpha.

going so far as to argue that assumptions about unidimensionality are both "unwarranted and misleading" (Buttel and Johnson, 1977:59). Consequently, multidimensionality has become something for scholars to *explain* as much as to test. Recently, such research has gained increased importance by intersecting with studies on mass environmental belief systems, together suggesting that public attitudes on the environment are rather crude, disconnected, and narrowly focused (deHaven-Smith, 1988, 1989, 1991).

Undoubtedly, such an interpretation is at odds with ample evidence on the durability of environmental concern over time (Mitchell, 1984; Gillroy and Shapiro, 1986; Dunlap, 1989, 1991a, 1991b; Dunlap and Scarce, 1991) and the near consensual distribution of those attitudes in the mass public (Mitchell, 1979, 1984; Ladd, 1982). Yet the dimensionality problem may, at least in part, be an artifact of faulty methodology. As data presented in this paper reveal, various measures of environmental concern are not as unrelated as previous studies have suspected. By using confirmatory factor analysis to control for both random and nonrandom sources of measurement error, not only can the environmental battery used by Gallup be reduced to relatively few latent factors, those factors are themselves strongly correlated.

In measuring environmental concern, therefore, does it truly "make a difference how it's measured" (Van Liere and Dunlap, 1981)? Of course, the answer is yes. Despite strong correlations between latent traits, current results clearly underscore the importance of measurement assumptions in survey design and data analysis. Consistent with a growing body of research that has demonstrated the importance of controlling for systematic response biases when evaluating political and psychological attitudes (Green, 1988; Green, Goldman and Salovey, 1993; Green and Citrin, 1994), data results in this study demonstrate how errors in measurement can effectively disguise strong correlations between various environmental measures that otherwise appear modest or inconsistent.

More importantly, however, these results raise important questions about the existence and sophistication of mass environmental belief systems. If, as deHaven-Smith (1988) suggested, multidimensionality should be viewed as lack of constraint, evidence of attitude stability across multiple measures seems to offer compelling evidence that public attitudes on the environment have matured into a logical, structured, and constrained belief system.

Considerable care, however, should be taken in drawing conclusions about the quality and sophistication of those beliefs.¹¹ Given that most

¹¹ It could be, for example, that truly multidimensional attitudes on the environment are *more* sophisticated, indicating that certain respondents are capable of drawing fine-grain distinctions between complex environmental issues.

attitudes on complex environmental issues can be represented by relatively few dimensions, current data results may signify that it is "cognitively economical" for people to reduce those concerns into a general environmental orientation, regardless of knowledge or clear reasoning (Pierce and Lovrich, 1980:282). In other words, as Achen (1975:1231) warns, "[a] certain stability of viewpoint is a necessary, but hardly sufficient condition for political understanding." In the final analysis, while coherent attitudes on the environment prove that Americans are increasingly willing to express concern for environmental quality, dimensionality alone may say little about their readiness to become active, well-informed participants in the environmental movement. **SSQ**

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