

# Public Perceptions of Global Warming

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## *Abstract*

*This study explored public perceptions of global warming and the diverse meanings that lay people attribute to the phenomenon. The data came from six weeks of observation of visitors to a special Smithsonian Institution exhibit on global warming. The focus of the fieldwork was to document the meanings that people gave to global warming and related concepts during their tour of the exhibit by recording the comments, questions, and other narrative accounts of the visitors. Six weeks of field research yielded approximately 150 individual observations of visitor's interpretations of global warming, energy consumption, the greenhouse effect, nonrenewable resources, pollution, and ozone depletion. Three patterns emerged from the data: a gradient of knowledge with the attentive public falling between the average citizen and those who have become engaged, a catastrophism that represents a reverse availability heuristic, and a belief in the robustness of the biosphere. While each of these have some relation to previous work, it would be useful to see if survey-based or experimental studies confirm these tentative conclusions.*

**Keywords:** *global warming, climate change, lay perspectives, public knowledge, qualitative research, Smithsonian Institute*

Over the last quarter century, most research on environmentalism has been conducted using quantitative analyses of survey data. This tradition is beginning to build cumulative knowledge regarding the demographic determinants of environmental concern (Jones and Dunlap 1992; Van Liere and Dunlap 1980), with a special focus on gender (Blocker and Eckberg 1997; Davidson and Freudenburg 1996; Stern, Dietz and Kalof 1993), race (Mohai 1990) and age/period/cohort effects (Honnold 1984; Kanagy, Humphrey and Firebaugh 1994; Mohai and Twight 1987). There is also some research on the social psychological processes that generate environmental concern (Stern, Dietz, Kalof and Guagnano 1995). Recently, international comparisons of environmental concern based on survey work are emerging (Dunlap, Gallup and Gallup 1993; Dunlap and Mertig 1995, 1997; Inglehart 1995). But little research on environmentalism has been done in the qualitative or ethnographic tradition.

One notable exception to the paucity of qualitative research on environmentalism is the work of Kempton, Boster, and Hartley (Kempton 1991; Kempton, Boster and Hartley 1995; Löfstedt 1992) on global change. In ethnographic interviews with a few dozen U.S. citizens, Kempton et al. find that the American public has a general awareness of global warming that seems to be based on broad generalizations from other environmental problems such as ozone depletion and local air pollution. When applied to climate change, these models often lead to understandings of both the mechanisms and the likely consequences of climate change that are discrepant with current scientific understanding. This pattern of understanding, roughly right in the broadest view but often quite incorrect in an understanding of mechanisms and consequences, is parallel to my findings.

The strength of the qualitative tradition in the social sciences is that it can be a very fruitful tool to explore how people are thinking about an issue. Qualitative work helps to identify the kinds of language people use and the conceptual frameworks they employ in making sense of complex environmental phenomena. Qualitative work can uncover the unexpected in ways that surveys, despite their many strengths, cannot. Eventually, qualitative data can lead to a new hypothesis to be tested with survey data.

Concern about climate change, like ozone depletion and biodiversity loss, is a relatively new phenomenon on the public scene. The possibility of climate change as a result of industrial emissions was proposed a century ago by Sven Arrhenius at Uppsala (Weart 1992), and some concern about climate was raised during the debates about SuperSonic Transport during the early 1970s. But broad public concern with climate change is an issue that has emerged in the 1990s, and thus it is especially useful to explore public perceptions of the issue in an exploratory way, following in the footprints of Kempton, Boster, and Hartley. Here, it may be useful to briefly explain the phenomenon of global warming, as we understand it. The prolific release of greenhouse gases (GHGs, such as carbon dioxide, methane, and water vapor) into the upper atmosphere causes a strengthening of the naturally occurring greenhouse effect, which leads ultimately to a warmer Earth. Called global warming, this phenomenon will (and is, it is argued) force a wide range of radical changes in the global climate, including more intense and

more frequent storms and floods, crop failures, droughts, and sea level rise. Global warming is the cause and climate change is the effect.

The goal of this study is to explore public perceptions of global warming and the diverse meanings that lay people attribute to the phenomenon. This research is exploratory and inductive, rather than explanatory and deductive.

## Method

The data came from six weeks of fieldwork conducted by the author while working as a docent at a special Smithsonian Institution exhibit on global warming. The focus of the fieldwork was to document the meanings that people gave to global warming and related concepts during their tour of the Smithsonian exhibit. A field journal was used to record comments, questions, and other narrative accounts of the visitors to the exhibit. Occasionally, the researcher used probes to engage people in a discussion of global warming. With young children, for example, the researcher would simply ask if they knew what traps heat as it leaves the Earth. After the visitors moved on to another exhibit, their narratives were recorded in the field journal, with the researcher's best estimate of key demographic variables, such as gender, age and national origin. Six weeks of field research yielded approximately 150 individual observations of visitor's interpretations of global warming, energy consumption, the greenhouse effect, nonrenewable resources, pollution, and ozone depletion.

The exhibit, entitled "Global Warming: Understanding the Forecast," was sponsored by the Environmental Defense Fund. All docents were former students of the Earth Systems Science program at Columbia University's Biosphere II, the current home of the exhibit. The exhibit itself was composed of three rooms off of the main entrance hall of the Museum. The rooms contained a variety of photographs, displays and hands-on demonstrations that were intended to give the public a sense of the basic science behind current concerns with climate change. A number of displays also provided some sense of the probable consequences of global warming, and of some of the steps that could be taken to slow global warming.

## Results

Three major patterns were observed in the narratives of the visitors to the exhibit: 1) ozone depletion is responsible for global warming, 2) the effects of global warming are interpreted as "doomsday" type phenomenon, and 3) natural phenomena such as volcanoes have a much more far reaching effect on climate change than humans ever could, or that the

Earth's atmosphere is such a vast system that any anthropogenic emissions are rendered insignificant. Each of these patterns is discussed in turn, including some of the key narratives that illustrate the pattern.

### **Pattern I: Depletion of Stratospheric Ozone is Responsible for the Greenhouse Effect and Global Warming**

Many people, when asked about global warming, tend to integrate this with the problem of stratospheric ozone depletion. I observed that the most frequent misconception among the public is that ozone is, in some way, responsible for either global warming or the greenhouse effect. Among the people who held this belief, a majority of them were under the impression that the ozone layer actually keeps heat out of earth's atmosphere. Consequently, it is the notorious "holes" in the ozone layer that allow more heat than is usual into the atmosphere, thereby causing global warming. This is, of course, a false assumption — but nonetheless on the right track. While stratospheric ozone does not keep heat out of Earth's atmosphere, it does filter out some key wavelengths of ultraviolet light from the Sun, satisfying one of the fundamental requirements for life to flourish on Earth.

Near the beginning of the exhibit was a working model that mimicked the greenhouse effect. It included a portion of the Earth encased in glass, with a thermometer both inside and outside the small greenhouse, showing the temperature difference. The very first displays concerned the climate history of the Earth, and how climates have changed (and will continue to change) on a geologic time scale. As they passed the greenhouse model, I simply asked visitors the question: "what traps heat in Earth's atmosphere?" Most of the responses were, I found, quite representative of the commonly held misconception that stratospheric ozone depletion is closely related or even equivalent to global warming. (Quotes from field notes are in italic type).

*A boy in middle school, when I asked him if he knew how the greenhouse effect worked, said that "light comes in and is trapped, and now escapes through holes in the atmosphere." His mother said that this was more than what she knew.*

This explanation of how the greenhouse effect works is inverted, since it is more of an explanation for a global cooling phenomenon. However, it seems he was thinking about ozone depletion when he gave his explanation.

*Two girls, probably late elementary school, knew the basics of the greenhouse effect (meaning that they knew it traps heat in Earth's atmosphere), and they knew the names of two greenhouse gases: methane and CFCs.*

*They also knew of carbon dioxide, but I had to coax it out of them. It may be significant that they mentioned CFCs as a greenhouse gas, since though it is a GHG, it is one of the least significant ones and it is responsible for stratospheric ozone depletion. Two junior high school age boys gave the ozone response to my question of what they think traps heat in the atmosphere. They explained that the holes in the ozone layer let in more heat (presumably they meant that they let in more heat than is normal), which melts the polar ice caps.*

*An Asian-American woman asked if the ozone was a separate thing from global warming. She mentioned that many kids think that the hole or holes in the ozone layer let in heat, thereby causing "global warming."*

*Three boys, between upper elementary and middle school, knew how heat was being trapped in Earth's atmosphere, though the oldest one told me that ozone traps heat. They were able to make the connection between putting more and more GHGs in the atmosphere and a warming Earth.*

*An elementary age boy, when I asked him what he thinks traps heat in the atmosphere, replied "ecosystems."*

These responses are colorful examples of a common trend in younger children. From among the many elementary level school groups that came to the exhibit, the children seemed to be somewhat knowledgeable about prevalent environmental issues. However, it seems that many of them become understandably confused when it comes to applying what they learn in school to more complex and abstract concepts.

*A mid-elementary schoolboy said that sunlight comes in, gets reflected by the clouds, and gets caught up in all the "junk" in the atmosphere. Later, he mentioned ozone, presumably as something that curbs this effect.*

*A man with his son and daughter was explaining global warming to them, specifically how the greenhouse effect worked. One of the things that he mentioned was that pollution in the air causes global warming.*

These two responses are representative of another typical misconception, that "pollution" in general is something that leads to global warming with little idea as to what varied effects different kinds of pollutants in the atmosphere may have on the environment.

*An older couple from New Zealand mentioned the ozone hole and asked if it was relevant to the exhibit. [Of course the issue of ozone depletion is especially relevant to people from New Zealand.]*

*An elementary age boy from Iceland had a fairly good knowledge of the greenhouse effect, but gave me the typical ozone response to the "what traps heat in the atmosphere" question.*

During the course of the study, I received many more of these typical "ozone" responses to my probing about the greenhouse effect. It was a rare event, in fact, that a visitor to the exhibit would not, in some way, incorporate the famous hole in the ozone layer with the entirely independent problem of global warming.

**Pattern II: Those who are *not* skeptical of global warming theories perceive the effects of global warming as a "doomsday" type of phenomenon, where the effects will be sudden and catastrophic, rather than subtle and gradual.**

The view that the effects of global warming will be both sudden and severe may be closely related to the degree of public concern about global warming. Moreover, this view seems to be closely tied to the common tendency for people's views to be easily influenced by inter-annual climate variation. In other words, people make their judgments about global warming based on the weather, not the climate. For example, an especially cold summer may make a skeptic out of one person (such as the summer this exhibit was at the Smithsonian), where as an especially warm winter can easily make firm believers out of would-be skeptics. Are these unusual patterns a consequence of global warming? Perhaps. However, to make a judgement based solely on this evidence is like somebody making a decision about the harmful effects of smoking because they once knew a heavy smoker who lived into his or her nineties. Global warming is a long term shift in typical weather patterns, while the weather in a given year may or may not reflect the overall trends involved in climate change.

*A man in his sixties, after listening to my explanation of the basics of the greenhouse effect and global warming, asked me "to explain, if you could, why we're having such cold weather lately." I tried to explain natural climate variability (failing). He persisted, asking if I've ever seen such a cold spring. It doesn't seem that this type of reasoning to disprove theories of global warming is unique to any one age group, but it is common to those who are skeptical about climate change.*

*A woman, in her thirties, from New Jersey, was confused as to how to explain the recent cold weather. "Winter never ended," she said. She seemed to know little about the greenhouse effect.*

*A man in his mid-40's was very clearly a supporter of global warming theories, and very worried about it. He believed that it has been getting progressively hotter over the years, which is meaningful to him because of his work as a framing contractor (most of his work is done outdoors). He told me about working outside in the hot sun and finds that he can no longer work all day long because of the heat. He did not know about natural climate variability prior to his visiting the exhibit.*

These responses reflect the trend of making judgements based on abnormal weather patterns. In particular, the response from the framing contractor illustrates how this trend may influence the perception that global warming is — or will be — a sudden, catastrophic phenomenon.

*A boy, either upper elementary or middle school, said that he was skeptical about doomsday theories. He quoted natural variability in explaining his position . . . He thought that some small change is plausible.*

*An older woman asked me on what scale this (global warming) would occur.*

*After making the connection between a warmer Earth and shrinking glaciers and rising seas, the three upper elementary school children I was talking to asked me how fast the glaciers will shrink. They also asked me if I thought that we are more concerned about the glaciers melting than the sea rising, or the other way around.*

In this last passage, it is key to note that the children asked how fast the glaciers will shrink. It is a more subtle point, but I often noticed that the consequences of global warming were almost always discussed in the future tense.

*A ten year old boy who was preparing for a school report on weather, asked me when I thought the change is going to occur. At this point I realized that there is this "doomsday" misconception, where the effects of global warming — whether they are sea level rise, crop failure, or anything else, will be sudden. There is very little attempt made to get people to realize that these changes are gradual.*

Finally, we discuss a pattern of observations that is intriguing, although the narrative illustrations are far fewer than for the first two patterns.

**Pattern III: Many people believe that natural phenomena such as volcanoes have a much more far reaching effect on climate change than humans ever could, or that the Earth's atmosphere is such a vast system that any anthropogenic emissions are rendered insignificant.**

*Two men from the American Petroleum Institute were critical of the exhibit. They pointed out that it did not accurately represent the relative amount of GHGs that humans release into the atmosphere compared to the natural greenhouse/GHG system. Especially considering water vapor, which, naturally, makes up 97% of the Earth's greenhouse gas system.*

*A man in his early sixties pointed out that the upward temperature trend of the past 120 years is just a glitch over geologic time. He wondered how we could know that humans have any discernable effect on the Earth's climate system compared to natural occurrences such as volcanoes.*

This response is closely related to the last pattern. This visitor to the exhibit was viewing the issue of global warming on a geologic time scale, not just simply a human time scale. It was rare to meet visitors who thought of global warming from within the framework of natural climate variability. Even the most intense skeptics did not think to argue the point from the standpoint of geologic time, though this is one of the more convincing arguments against the evidence for global warming.

*A man in his thirties said that he thinks that the human pollution is not significant compared to the natural process of our climate system, citing as evidence that it (our climate system) is so old, and the fact that it naturally fluctuates in and out of ice ages.*

*A man in his early fifties said that it seems like we just don't know how much of an impact humans have on climate change.*

*A young man from Perth, Australia, in his early twenties, admitted that he was a skeptic of global warming. He said that it is "egotistical of us to think that we can alter something as immense as the atmosphere." He asserted that we cannot destroy the Earth. He understood that we emit very large amounts of carbon dioxide, though these amounts are miniscule compared to the vastness of our atmosphere.*

## Discussion

This research examined museum visitors' narratives about global warming. There are three overall patterns that emerged from this ethnographic work. First, as noted by Kempton and his collaborators (Kempton 1991; Kempton, Boster and Hartley 1995), people tend to confuse climate change with stratospheric ozone depletion. But, in contrast to the Kempton et al. findings, the people visiting the

Smithsonian did not commonly confuse global warming problems with local air pollution problems. This may indicate that those self-selecting to visit the global warming exhibit made finer distinctions than the average citizen, even if the distinctions were somewhat blurred. Or perhaps it indicates that public perception has become more sophisticated in the years since the Kempton studies. Thus, while most Americans express strong concern about the environment and have a folk ecology that is a reasonable first approximation to environmental science (Stern, Dietz and Guagnano 1995), they have little detailed knowledge. The exception occurs when people face a local problem, such as a toxic waste site. Lay people then become quite sophisticated about salient scientific and technological issues (Brown and Mikkelsen 1990).

My results indicate an intermediate step between the very approximate knowledge of the general public and the surprising expertise of local activists — an attentive public who still confuses some details but makes finer distinctions than the general public. There is a compression of concepts to simplify things, but the degree of compression and resulting distortion differs depending on how engaged someone is. Of course, this makes great sense if people are rational. People, in their busy day to day lives, are seldom faced with decisions about climate change or other environmental problems. There is a cost to learning more, as economists have often noted in the theory of information costs. Thus, people tend to know as much as is useful to them — enough to take a basic position on general issues. The challenge for those advocating environmental policy is to find ways to make information salient to the public, a public with knowledge that is roughly right but can easily be confused and misdirected about detail.

A second pattern is the opposite of the general pattern of folk ecology. While most of the public considers the biosphere vulnerable to human action, some clearly see the scale of human activity as too small to have much influence. This is, of course, a familiar story. Dumping of toxins in the land, air and water has usually been justified by the immense capacity of the system to absorb these perturbations.

A third and final pattern is the “catastrophism” of many visitors. They assume that climate change will produce a sudden dramatic change, or at least that casual day-to-day observation can reveal the pattern of climate change. Work in cognitive psychology has revealed what is referred to as the availability heuristic — that dramatic events are seen as more probable than equally or even more frequent events that are less dramatic (Kahneman, Slovic and Tversky 1982). The plane crash that kills hundreds makes air travel seem risky while the thousands of less dramatic auto deaths have little

effect on public perceptions of risk. Here we have an obverse availability heuristic — that people who are concerned expect the consequences to be dramatic.

There are a number of limitations to this study. Most important, 1) the sample used was a special group of people who were interested in the global warming exhibit at the Smithsonian, 2) the observations were taken in the context of the exhibit, 3) the data collection was limited to six weeks of observation, and 4) the analysis was, in fact, influenced by the researcher’s interpretation of the meanings attributed to global warming by the lay public. But such is the nature of ethnographic work. An attempt was made to be as objective as possible, but subjectivity in research of this nature is unavoidable: science is a socially embedded activity (Gould 1986). However, some insights into public perceptions of environmental problems have emerged and should provide important questions for future work in this area. Three patterns are identified here: a gradient of knowledge with the attentive public falling between the average citizen and those who have become engaged, a catastrophism that represents a reverse availability heuristic, and a belief in the robustness of the biosphere. While each of these have some relation to previous work, it would be useful to see if survey-based or experimental studies confirm these tentative conclusions.

Some of the perceptions observed in this research may have been grounded in political argument, conservative rhetoric, and mythmaking about climate change (I thank an anonymous reviewer for this insight). This issue and a number of other important questions could inform future qualitative work. For example, what are some things that would make the middle aged think that the phasing out fossil fuels is unrealistic for economic reasons? What are some things that would make them think otherwise? How is people’s knowledge of growing populations and growing rates of per capita energy consumption related to their knowledge of what is being done to mitigate the causes of global warming? How do short-term trends, such as recent cold weather, exacerbate the misperceptions of global warming as a doomsday phenomena? What are the effects of global warming in the public’s view? These are questions that, at least initially, would best be addressed with further ethnographic work.

## Endnote

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