

Examining Visitor Beliefs, Concerns, and Priorities in Relation to Climate Change: An Audience
Segmentation Analysis at Three Informal Education Facilities in Oregon

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ABSTRACT

With over 175 million Americans visiting each year and the ability to create unique learning experiences, informal science institutions may play a greater role in climate change education in the coming years. As facilities in Oregon begin to incorporate climate science and solutions into their educational programming, effective communication across diverse audiences can be challenging. Based on a nationwide study conducted by researchers at Yale and George Mason Universities, this project examined visitor perceptions of climate change across six previously identified audience segments. Research took place at the Oregon Zoo in Portland, and both the Oregon Coast Aquarium and Hatfield Marine Science Center in Newport. Segment types were found utilizing a condensed version of the national survey and provided statistical algorithm. Participant distributions among the segment types were compared across sites and with the national data to provide a better understanding of the unique beliefs, concerns, and priorities of each audience.

The results of the survey indicated that a large majority of the 300 visitors who participated across all three sites fell into the two segments that held the highest degree of concern, interest and worry regarding climate change and were most likely to take action in their daily lives. This was a significantly larger percentage than the data from the national study. These findings suggest that informal educators at the three sites may benefit from understanding the attitudes and needs held by these audiences in particular. One reason for this high level of concern compared to the general American public may be due to the increased level of educational attainment among visitors at the sites. Differences in education across segment types were found to be significant, with the most alarmed visitors having a more extensive educational background than

the unconcerned. Finally, it is apparent that even though the high level of concern among the sites is encouraging for educators who hope to inspire action-oriented behaviors, the audiences still vary widely in their attitudes toward climate change. Recommendations for engaging each audience are provided in this report.

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Introduction

Although the discussion of climate change has sparked research efforts and debates for several years, public and political attention has rapidly increased in the last decade. As new scientific reports emerge, the topic of climate change continues to become a larger part of our everyday vocabulary. From political campaigns and newspaper articles to popular apocalyptic style movies such as “The Day After Tomorrow”, the American population has been inundated with a vast array of information on climate change, resulting in a dramatic rise in public awareness (Crate & Nutall, 2009). However, while the general public may be more aware now than in the past, confusing scientific models, conflicting reports, media portrayal and other sources contribute to a nationwide discourse that is anything but homogeneous. Recent findings from public opinion studies over the past few years suggest that people not only vary widely in their knowledge and understanding of climate change, but also in their underlying beliefs, regardless of how much they know (Leiserowitz et al, 2009). And while the scientific community as a whole tends to view changes in the global and local climate as a serious issue facing both the environment and human society, the United States has yet to address this issue with the same sense of urgency. Thus, the challenge for both scientists and educators today has become how to engage the American public in creative and powerful ways to communicate climate change science effectively across these diverse audiences.

In the past, most research into perceptions of climate change has been conducted on a national level to inform policy makers and formal educators. This has changed in recent years, however, as more scientists urge the American public to take action before it is too late (Moser & Dillings, 2007). Local governments and organizations across the nation are beginning to address issues such as carbon dioxide emissions and sustainable energy practices. In the coming years, citizens will need to make decisions on climate and energy policies as well as how and if they should

respond to climate change in their daily lives. With this in mind, it is imperative that people be able to find accessible, informative, and credible sources that can provide them with the knowledge to make more informed decisions.

One sector of American society that has become increasingly efficient at developing educational materials that appeal to a variety of audiences is the informal science institution. With over 175 million citizens visiting each year and the ability to create experiential and unique encounters with science and wildlife, zoos and aquariums encompass an essential part of science education across the U.S (AZA, 2009). An aspect of these types of facilities that make them a particularly good educational source for the general public is their ability to contribute to a type of learning called *free-choice learning*. Unlike formal education in schools, this type of learning occurs across a variety of settings throughout a person's life and is guided by the individual's interests, motivations and needs (Falk & Dierking, 2002). It has been suggested that in their lifetime, people will encounter most of what they may learn about science and conservation through these free-choice learning experiences in informal science settings (National Research Council, 2009). Therefore, places such as zoos, aquariums and science centers may play a greater role in climate change education in the coming years.

Study Purpose

In the summer of 2009, the Northwest Zoo and Aquarium Alliance (NWZAA) - a consortium of seven zoos and aquariums in Oregon, Washington, and Idaho - adopted a three year strategic plan that identified affiliated institutions as key players in the local conservation community. The plan outlined the following main goals with the mission to “promote collaboration among Pacific Northwest zoos and aquariums to engage in action that sustains ecosystems” (NWZAA, 2009):

- Ecosystem Conservation: Contribute to ecosystem-scale conservation outcomes in the Pacific Northwest and convey concepts to diverse audiences.
- Green Practices: Lead by example to reduce Alliance facilities' and visitors' ecological footprints.
- Citizen Conservation: Engage visitors and communities in taking conservation action and connecting with nature.
- Public Policy: Build the Alliance's reputation and credibility as a conservation organization and as a player in the public policy arena.¹

All four goals stressed a commitment to citizen engagement with a high priority on projects related to climate action and education - an effort geared to address climate change impacts both globally and in the Pacific Northwest. In addition, the Alliance encouraged affiliated zoos and aquariums to lead by example to further motivate visitors to become more informed and concerned citizens in regard to conservation and climate related issues.

But, how does an informal science facility accomplish the goal of climate action and engagement? In a society in which perceptions and knowledge of climate change differ so dramatically across the American public, how can educational exhibits or programs effectively communicate with such diverse audiences?

In 2008, a study called “Global Warming’s Six Americas: An Audience Segmentation Analysis” was conducted by researchers at Yale and George Mason Universities to begin to address the challenge of communicating about climate change to multiple audiences on a national level. The

¹ NWZAA’s full report of their three-year strategic plan can be found at <http://www.nwzaa.org/>.

research concluded that based on their beliefs, policy preferences, risk perceptions, and behaviors, people can be placed into one of six segments ranging from the unconcerned to the alarmed. The report also emphasized that by looking at the differing beliefs, behaviors, and risk perceptions across segments, it is apparent that public reaction to the issue is not simply a linear response to scientific information. Rather, people are already predisposed to either reject or accept scientific findings, proposed policies, and solutions based on their individual perceptions (Leiserowitz, 2009). The implications of this finding suggest that if informal educators or science institutions hope to instill knowledge or promote climate action, it will be essential to first understand people's underlying perceptions. This conclusion concurs with results from various other studies on visitor learning and behavior in free-choice learning situations. Successful learning outcomes are not solely determined by visitor interaction with the topic, but by their prior interests, knowledge, and attitudes (Hein, 1998; Falk & Dierking, 2000). In other words, similar to the process of creating a new policy that may affect a multitude of stakeholders, there is no "one size fits all" solution for effective communication. It is imperative to first know the audience.

This report attempts to uncover some of these underlying beliefs and concerns about climate change among visitors at three informal science facilities in Oregon - two of which are directly affiliated with the NWZAA and involved in the goals outlined in the strategic plan.² The project utilized the methods developed by the researchers at Yale and George Mason universities to categorize the visitors into each of the six audience segments identified in the national report. The overall goal of this was to provide all three sites with a better understanding of how their visitors perceive and think about the topic of global climate change, how their visitors compare with visitors to similar sites, and to supplement other related studies that have recently been

² Note that in this report, the terms *climate change* and *global warming* are used interchangeably for the purpose of remaining consistent with the national study. However, these terms in themselves may evoke different responses from people and should generally be handled with care. See the conclusions section for more details on this.

conducted among the sites and at other facilities across the country (see McCracken, 2009; NWZAA, 2010). To meet this goal, the project was designed to answer three main questions:

- 1) Based on segment types, how concerned are visitors about climate change and are there any differences between sites?
- 2) In relation to climate change, how do the beliefs, concerns, and priorities of visitors at informal education institutions in Oregon compare to those of the general American public?
- 3) Are there any correlations between visitor demographics and audience segments?

The following sections attempt to address these questions, creating a basic picture of how visitors engage with climate change. It should be noted however, that while this report provides an important insight into the mind of the zoo, aquarium, or science center visitor, the prior knowledge, experiences, and values that a person brings into a facility are inherently complex. This data alone will not determine the most effective communication methods, but along with subsequent studies, these results can aid informal science educators in understanding how visitors might respond to and make meaning from potential climate change messaging.

After a brief background on the national study that served as the basis for the project and the role of the informal science facility in climate change education, this report outlines the research methodology, including a description of the survey instrument and segmentation analysis. Results of the analysis across sites are discussed and compared to the national data, with an overview of potential implications and future research needs. Data from the study will be shared with the three sites, as well as California Public Broadcasting's "Climate Watch" program and the researchers at Yale and George Mason universities in the hope that it may provide a perspective of how visitor perceptions compare with other facets of the population and the country at large.

Background

Climate change has been a topic of conversation and controversy for decades, but recent scientific studies have raised an even louder alarm, naming it one of the biggest environmental challenges that humans have ever faced. For example, the United Nations Intergovernmental Panel on Climate Change (IPCC), an organization tasked with reviewing the most recent scientific and socio-economic findings, released an alarming report in 2007. In summary, the report stated two assessments about the climate change situation: (a) warming of the climate system is *unequivocal* and is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level; and (b) most of the observed increase in global average temperatures since the mid-20th century is likely due to the observed increase in *anthropogenic* greenhouse gas concentrations (IPCC, 2007). In other words, based on this report, it can be assumed that the majority of scientists now agree that climate change is happening, that human-related activities have largely contributed to the observed impacts over the last two centuries, and that they will continue to do so if left unregulated.

Why study beliefs and concerns regarding climate change?

Armed with this information and acknowledging that America contributes to about a quarter of the world's greenhouse gas emissions, scientists, environmental organizations, and advocates have urged the U.S. government and general public to take action against potential impacts now (NRC, 2009). This has been a rather futile task, however, as both politicians and citizens still generally place the issue of climate change at the bottom of a long list of economic and social problems facing the country today (The Ocean Project, 2008). In fact, a recent study conducted

by the PEW Research Center found that the issue of global warming ranked below twenty other public policy priorities for 2010 (Christian, 2010).³

In their anthology on communicating climate change, Moser and Dillings (2007) noted several reasons why there may be a lack of urgency among the American population even in the wake of new scientific findings. One key reason included that potential climate change threats are characterized by a perceived lack of immediacy, with impacts remote in both place and time. This lack of immediately perceivable impacts may lead to a tendency for people to disconnect from the issue. For example, it is impossible for an individual person to physically observe the level of carbon dioxide in the atmosphere or rising sea levels - these occur over a large span of time and can affect places differently. In addition, any action taken now may not produce a prompt response, resulting in an absence of immediate psychological gratification; therefore proposed solutions such as buying a more efficient vehicle can be difficult to understand. Finally, from their point of view, contemporary humans in industrial and post-industrial societies are often insulated from their environment as lifestyles become more accustomed to the comforts and convenience of working in the indoors. The authors suggested that all of these reasons have contributed to a country that tends to be more willing to address what are perceived to be more concrete, immediate concerns, leaving the issue of climate change in the background.

As outlined in the introduction, several recent studies have set out to gain a better understanding of how reasons such as these might contribute to the ways in which people respond to climate change. The most thorough and informative research looking at people's underlying perceptions, and the basis for this report, was conducted on a nationwide scale and is discussed below. Detailed findings from the research can be found in the full report by Leiserowitz et al (2009), but

³ Priorities that ranked in the top ten included the economy, terrorism, medical benefits and education.

for the purposes of this study, only those results that were used for comparison with the informal science facilities in Oregon will be discussed.

The Six Americas Study

In May 2009, “Global Warming’s Six Americas: An Audience Segmentation Analysis” was released by the Yale Project on Climate Change and George Mason University Center for Climate Change Communication (Leiserowitz et al, 2009). The report outlined the results of a nationally representative survey of 2,164 American adult citizens who answered over ninety questions related to their climate change beliefs, perceptions, priorities, and policy preferences. From a set of more than thirty variables, latent class analysis aided researchers in identifying six different audience segments, with each segment representing distinct beliefs and concerns related to climate change.

The distribution of segment types in the American population was first analyzed in the 2009 report and has since been reevaluated after two new surveys were conducted.⁴ Although each differed somewhat in their results, potentially due to changes in the political and cultural landscape of the U.S. between May 2009 and June 2010, the figures below indicate only the results of the most recent report which was released in June 2010. To compare the data obtained from the informal science centers in Oregon, it was important to assess peoples’ perceptions within a close timeframe, considering that these can often be shaped by events outside the control of the study.⁵ The variation between reports is of interest, however, and potential implications of this will be discussed later in this report.

⁴ “Global Warming’s Six Americas” national survey reports were released in May 2009, January 2010 and June 2010. All three reports can be found at <http://environment.yale.edu/climate/publications/>.

⁵ For example, events that were thought to have an impact on segment distribution across the three survey periods in the “Six Americas” study included the 2010 Gulf Oil Spill and unemployment rates.

Figures 1a and 1b provide an overview of the segments in which people share different underlying beliefs and levels of concern about climate change. People categorized into one of the three segments in Figure 1a ranged from the Alarmed and Concerned (both knowledgeable and worried about global warming and the most likely to personally take action) to the Cautious (those who were not very worried but still acknowledging that global warming could be happening). Slightly over half of the population (52%) was characterized as Alarmed or Concerned, whereas about a quarter (24%) was considered Cautious.

Figure 1a: Description of the Six Audience Segments

The Alarmed (13%): Convinced that global warming is happening, are very worried about it and have thought a lot about the issue. They think they are well informed about the causes, consequences, and potential solutions, and are highly unlikely to change their minds. They believe there is a scientific consensus that global warming is happening, and overwhelmingly believe that human activities are the primary cause. Of the six segments, they are the most likely to view it as a threat to them personally and to future generations.

The Concerned (28%): Also convinced that global warming is happening, although they are less certain than the Alarmed, and are relatively worried about it. They have thought some about global warming, believe they are somewhat informed, and are unlikely to change their minds about the issue. Most believe there is a scientific consensus that global warming is happening and that human activities are the primary cause. Compared to the Alarmed, they are less likely to perceive it as a threat to them personally or to future generations, but distinctly more so than members of the other four segments.

The Cautious (24%): Somewhat convinced that global warming is happening, but this belief is relatively weak, with many saying they could change their minds. They have only thought a little about global warming, do not consider it personally important, feel only somewhat informed, and tend not to worry about it. About half believe that human activities are the primary cause, and over a third believe there is a lot of disagreement among scientists over whether global warming is happening. They do not perceive global warming as a significant personal threat, but do believe it may be a threat to future generations.

In contrast to the three segments listed above, people with the lowest levels of concern were categorized by one of the three segments in Figure 1b. These ranged from the Disengaged (who had not thought much about the topic) to the Doubtful and Dismissive (who were either sure that

global warming was not happening or simply did not consider it to be a threat). Together, the Dismissive and Doubtful made up another quarter of the population (24%), with one tenth characterized as Disengaged (10%).

Figure 1b: Description of the Six Audience Segments

The Disengaged (10%): Not at all sure that global warming is happening and are the group most likely to say they could easily change their minds. They have hardly thought about global warming at all, do not consider it personally important and tend not to worry about it, saying they are only a little informed. Just over a third believe that human activities are the primary cause and a majority simply don't know enough to say whether scientists agree or disagree that global warming is happening. Likewise, they overwhelmingly say that they don't know whether global warming will harm them personally or future generations.

The Doubtful (12%): Do not know whether global warming is happening or not and are not worried about it. They have thought only a little about global warming, are only a slightly informed, yet say they are somewhat unlikely to change their minds about the issue. Most believe there is a lot of disagreement among scientists over whether global warming is happening and believe that if global warming is happening, natural changes in the environment are the primary cause. A majority say global warming will harm them personally or future generations only a little or not at all, although some simply say they don't know.

The Dismissive (12%): Sure that global warming is not happening and are not worried about it at all. They say, however, that they have thought some about global warming and believe they are well informed about the causes, consequences, and potential solutions – i.e., that there are none, because it doesn't exist. They are very certain about their views, saying they are very unlikely to change their minds about the issue. Many flatly reject the proposition that global warming is happening, while a majority believe that if global warming is happening, natural changes in the environment are the primary cause. Likewise, a majority believe there is a lot of disagreement among scientists over whether global warming is occurring, while over a fifth believe there is a scientific consensus that global warming is not happening. They overwhelmingly say that global warming will not harm them personally or future generations at all.

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Adapted from Leiserowitz, A., Maibach, E., and Roser-Renouf, C. (2009), pp 5-6, and McCracken, K. (2009), pp 10-11. Percentages obtained from Leiserowitz, A., Maibach, E., and Roser-Renouf, C. (2010), p 9.

The findings from this segmentation analysis resulted in several key insights into the perceptions held by the American public and the ways in which they differed. While the segment types consisted of a few differences in demographic characteristics, they varied considerably in values, behaviors, and political preferences. For example, those in Figure 1a tended to be defined as liberal, with the Alarmed as the most willing to work toward reducing impacts in their own lives

(if they had not done so already). On the other end of the spectrum were the Dismissive, who rejected the idea that global warming was happening at all and often worked passionately against mitigation efforts. Along with the Doubtful in Figure 1b, they were the segment most likely to be defined as conservative and actively ignore information that went against their beliefs.

From this study, it is apparent that the majority of Americans seem to be at least somewhat concerned about global warming and view it as a potential risk. Although this finding is promising for both climate scientists and educators who hope to encourage the public to take action, the results are much more complex. Many of the participants who said that they were concerned about global warming also indicated that they did not think that it would harm them personally and that it would more likely affect future generations. These were also the people that tended to fall into the largest segments (Cautious-Concerned). Perceptions such as these can lead to a reduced sense of urgency and political motivation (Moser & Dillings, 2007). The researchers also conducted a related study that focused more deeply on assessing the public's general knowledge of climate change science in 2010. They found that many people who did believe that global warming was happening often did not understand the causes and held several misconceptions about impacts and solutions. Graded on a typical academic letter scale, the majority (52%) of Americans received an "F" on a questionnaire designed to test their knowledge about climate change, with less than a tenth (8%) receiving a grade of an "A" or "B" (Leiserowitz, 2010). These statistics suggest that even if people are concerned, they may not have the immediate motivation or tools to act.

Given these findings, the researchers encouraged organizations to address not only what people know about climate change, but also the motivations behind their behaviors. All three reports related to the "Six Americas" study strongly emphasized that without understanding these

fundamental differences between audiences, communication efforts would be built on an incomplete foundation.

The Role of the Informal Science Institution

According to the AZA, zoos and aquariums in the U.S. attracted more than 175 million visitors in 2008, and connected with 12 million students and 400,000 teachers in the last decade (AZA, 2010). These estimates are considerably larger when adding the number of people who visited other types of informal science facilities, such as museums and science centers. Popularity of these types of institutions can be attributed to several aspects of the informal, free-choice learning environment in which they are situated. By combining science with interactive exhibits and important conservation messages with entertainment, visitors are provided with unique learning experiences that they do not find in their everyday lives. These institutions also have the tools to translate confusing or abstract scientific concepts in ways that make them more comprehensible to the general public. Thus zoos, aquariums and science centers have the potential to serve as powerful educational arenas across the U.S.

In addition to their unique setting, many informal science institutions have developed a goal to focus on conservation-based education (AZA, 2010). In fact, to be accredited under the AZA, zoos and aquariums are required to provide conservation messaging throughout their exhibits. Although some research has found that these messages can often be ignored by visitors (Screven, 1992), other studies have discussed the fundamental changes that a conservation-oriented facility can evoke. For example, a study at the National Aquarium in Baltimore found that visitors with minimal to moderate interest coming into the site left with more interest and concern for conservation upon exiting (Falk & Adelman, 2003). Similarly, a nationwide study of AZA-accredited institutions produced visitor data that indicated that these types of facilities do seem

have a measurable influence on attitudes toward conservation (Falk et al, 2007). Although these studies suggest that the science center may play a role in shaping specific attitudes toward the environment, it is difficult to determine what kind of behavioral changes, if any, were precipitated by the visit. However, they do propose that the role of the informal science arena could potentially be an important one and finding the best methods to communicate about climate change become particularly significant.

As discussed in previous sections, there is a challenge, however, when communicating conservation messages in any setting that attracts a large diversity of audiences. The inherent nature of the informal science facility itself makes it even more difficult. Falk et al, (2009) defined the free-choice learning that occurs in informal sites as “learning [that] is largely under the choice and control of the learner.” Falk and Dierking (2002) further indicated that visitors do not come to sites as “blank slates”, but rather bring with them their own interests, knowledge, and prior experiences that ultimately determine how they interact with and make meaning from exhibits. Existing beliefs often have a stronger impact on how a message is interpreted, even more so than the message itself (Dunwoody, 2007). Therefore, it has been suggested that the greatest task for educators in these settings is to design messages that will be both consistent and engaging for individual visitors.

As part of their strategic plan, the NWZAA began research into visitors’ perceptions of climate change in the summer of 2009 at the Oregon Coast Aquarium, Oregon Zoo, and the Woodland Park Zoo in Washington to begin addressing this challenge. Researchers conducted a baseline survey to study visitors’ awareness, willingness to take action in their daily lives, and to identify their views on the role of the zoo or aquarium in climate change education. In summary, they discovered that visitors were generally concerned about climate change and its threat to the natural environment, and were open to hearing what the sites had to say about potential solutions

(NWZAA, 2010). Therefore, the methods utilized in this report are meant to supplement the original NWZAA study to see how the level of concern is distributed across visitor populations and what that might mean for the role of the informal science institution.

Prior to the national “Six Americas” study, researchers at informal science sites were already utilizing similar segmentation analysis methods to understand their audiences’ broad underlying knowledge and motivations (see Packer & Ballantyne, 2002; Falk & Adelman, 2003). However, this is the first known project in which it has been used to assess specific perceptions related to climate change at sites in the Pacific Northwest.

Methods

The Study Sites

Data were collected at three informal science facilities in Oregon during the summer of 2010 (August 27 - September 26). Participating institutions included the Oregon Coast Aquarium and Hatfield Marine Science Center, both located in Newport, and the Oregon Zoo in Portland. A fourth organization, Marine Discovery Tours, a boat excursion operator in Newport who specializes in ocean science education, also participated in the study. However, due to time constraints at the end of the season, the sample size obtained from Marine Discovery Tours was very small (n=28). This did not provide enough data to draw any significant conclusions. Therefore, the sample from this site was not included in the analysis, but it will be summarized briefly in the discussion to provide a baseline for any future research.

The three main sites were chosen for a number of reasons. Both the Oregon Coast Aquarium and the Oregon Zoo are accredited under the Association of Zoos and Aquariums (AZA) and are

members of the NWZAA. In addition, results from the 2009 Alliance survey indicated that many of their visitors were open to learning more about climate change solutions in these settings (see background section). And although they are not affiliated with the NWZAA, educators at Hatfield Marine Science Center are currently in the process of developing new ideas for climate change engagement, and expressed interest in learning more about their own visitors' beliefs and concerns.

Located in the small, coastal town of Newport, the Oregon Coast Aquarium is a private, not-for-profit facility that focuses in marine and aquatic ecosystems. The mission of the aquarium is to provide educational experiences and foster appreciation for local and global ocean ecosystems (Oregon Coast Aquarium, 2010). In addition to this, its pursuit to serve as a community resource for conservation, education, and research offers a unique setting for communicating the impacts of climate change on aquatic environments. In fact, the aquarium originally initiated the idea for this project after determining that the "Six Americas" methodology might provide further insight into the perceptions of its visitor population. It is open year-round with ocean science exhibits and programs for individuals, families, and school-groups. During the period of data collection, it was open from 9am until 6pm each day.

Across the street from the aquarium, Hatfield Marine Science Center serves not only as an educational resource for the community, but also a scientific laboratory for both students and professionals. It was originally established as a marine research center for nearby Oregon State University and now consists of multiple departments and university programs (Hatfield Marine Science Center, 2010). Its location in Yaquina Bay provides a setting for in depth scientific research and exploration. Free to the public, the Visitor Center translates this research through interactive exhibits, workshops, field trips, and other educational experiences. Climate change impacts are becoming a larger part of the center's research efforts and the need to effectively

communicate with the public is imperative. The Visitor Center is open throughout the year, with business hours shorter in the winter (Thursday - Monday, 10am - 4pm). As part of this study, the majority of research took place at the beginning of the winter season following Labor Day.

With the largest facility of the three sites, the Oregon Zoo caters to millions of visitors annually. Its location near the city of Portland is ideal for attracting individuals and families throughout the year. The zoo strives to inspire the community to create a better future for all types of wildlife and is home to over 20 animal exhibits, ranging from local animals of the Pacific Northwest to the African savanna and Arctic Polar Bear. It operates with the mission to engage and motivate visitors to act on behalf of wildlife, design projects tailored to reflect diverse audiences, and serve as an example for responsible environmental practices (Oregon Zoo, 2010). With this in mind, several efforts to engage the public in climate change education are already in progress. These include the placement of new signs along selected paths and additions to their polar bear exhibit. Also open throughout the year, research was conducted at this site during regular summer business hours (8am - 6pm).

Data collection at the three facilities resulted in a visitor sample representing three different types of informal science audiences. The sites not only vary in educational focus (e.g. aquatic ecosystems vs. scientific research), but also in size, cost, and annual attendance: the zoo hosts over 1.3 million visitors per year, whereas the aquarium and science center host 450,000 and 150,000 per year respectively (Nickels 2008; Oregon Zoo, 2010). These differences provided for a more in depth analysis of informal science audiences as a whole, as well as an interesting inter-site comparison.

Data Collection Methods

Collection of data at both the zoo and aquarium took place over two busy summer weekends (Friday - Monday). Data from Hatfield Marine Science Center were obtained during the weekdays as well as the weekends and took place over multiple days within the four weeks. The difference in collection times was due, in part, to the smaller visitor population at the science center. This facility generally sees a significantly smaller proportion of visitors each day than the other two sites.

For the duration of the project, each site provided the researcher with a table and chairs. Placement of the table depended on the layout of the site, but was typically set up in a centralized, accessible location with a large flow of traffic. For the aquarium, this was located in the atrium, an area close to the entrance and restaurant. The Visitor Center served as the study setting at the science center with the table set up along a wide section of the walking path, near the popular tide pool exhibit. Due to the large size of the zoo, the table was set up along a major pathway near the amphitheater and eating areas to reach as many visitors as possible.⁶

Participants

Adult visitors over the age of 18 were recruited for the study at each location. A sign was placed on the table indicating that research was being conducted and encouraging visitors to help out (the research focus was not identified here). While time and funding constraints did not allow for a completely randomized recruitment method, this was not necessarily feasible as the data were not collected at a particular exhibit, but in a general public area at each site. Visitors were

⁶ This area at the zoo hosts a number of shows and concerts and can get very crowded. During the study period, a bird show took place every few hours. It is important to note that depending on the events, this location may or may not be a suitable area for similar data collection in the future.

approached by the researcher and asked if they “would like to participate in a survey to help out with research for future exhibits and programs,” while others offered their help voluntarily. The sample obtained was found to be representative of the total visitor population at each site, as is evidenced by the demographic data (see Figure 2). Therefore, the data can be considered a close assessment of the total visitor population. However, the results must be interpreted with caution - they reflect the perceptions of the overall visitor audiences at the three facilities, but cannot be generalized to other facilities or age groups (under 18).

Participants were given a clipboard and asked to read over a letter of consent before proceeding (a copy of the letter is provided in Appendix A). In accordance with IRB protocol, the letter provided a brief overview of the purpose of the study as well as contact information for any follow-up questions or concerns. Given that no identifying questions were asked, all data collected remained anonymous and no signature of consent was required. Each participant was also provided with a copy of the questionnaire which took five to ten minutes to complete.

While visitors were not compensated for their participation in the study, they were offered small site-specific items for their help upon completion. For example, the aquarium provided stickers and coloring sheets related to their new “Swampland” exhibit for the researcher to place on the table. This provided a great distraction for kids who were waiting for a parent to finish filling out a questionnaire. At the zoo, coloring sheets of animals and marine life were provided. Similarly, the science center offered stickers and ocean postcards to participants as a thank you.

Instrument

A main objective of this study was to compare the data from the informal science audiences to that of the “Global Warming’s Six Americas” June 2010 nationwide data. To do this the visitor

questionnaire needed to remain consistent with the national study. A replication of complete national questionnaire was not feasible, however, due to its length (over 90 questions).

Therefore, the researchers at the Yale Project on Climate Change provided this study with a shortened version of the original survey instrument. This questionnaire consisted of 16 questions related to participants' beliefs, perception, and concerns regarding global warming.

This condensed version was originally created for research "in the field" and is currently utilized by Northern California Broadcasting Network's Climate Watch program on their website. For this project, a paper version was generated (see Appendix A for the complete questionnaire).

After pilot testing, only the font size and answer bullets were altered to make the questions easier to read. The overall wording and question order was not changed. General demographic questions including zip code, age, sex, and education level were added at the end for analysis.

Data Analysis

Answers to questions were coded and entered into an excel spreadsheet, utilizing the same coding system as the national study. For example, for the third question on the survey, "how important is global warming to you personally?", the answer "not at all important" was coded as "1", while the answer "somewhat important" was coded as "2", and so on. The main reason for coding the questions this way was to prepare the data for segmentation analysis.

Segment type was identified through a statistical algorithm that was also developed by Yale and George Mason Universities. A participant's answer to each question was entered into the provided spreadsheet. Using discriminant functions, the analysis would result in a number indicating one of the segments that was described in Figure 1a/b. According to the researchers, this tool is, on average, a little over 80% accurate when utilizing the shortened survey.

Several answers were reverse coded in the original statistical algorithm, where for example, the answer “not at all important” was indicated by “1” for one question but was “4” for another. To maintain consistency across all questions, these answers were then re-coded after segment type was identified. These alterations will be provided for individual sites who wish to review the excel data.

All data were analyzed using the program PASW Statistics 17.0. Chi-squared tests (χ^2) for significance were conducted in order to compare the distribution of segment types between facilities. Cramer’s V values were then found to determine the strength of significance. Demographics were also examined using these values, with both values provided in the results where appropriate. Survey questions were examined by looking at frequency distributions to compare across the samples and are summarized in the results. A more detailed analysis of individual questions was not considered necessary for this project. Visitors were placed into a particular segment based on their answers to the survey questions, so significant differences between segment types were assumed.⁷ Nearly all questions resulted in mean values that followed a predictable linear pattern - the Alarmed typically resulted in the highest value, whereas the Dismissive had the lowest. Exceptions included those questions that resulted in a U-shaped pattern where both the Alarmed and Dismissive scored similar mean values. The national results also followed a similar pattern, thus differences between segments for each question were nearly identical to the national study. However, since one of the main goals of this project was to provide each study site with an understanding of how the segment types differ, these patterns remain of interest. Therefore, more detailed statistics from each individual question are provided in Appendix C for a detailed review. Depending on the question, these included either a graph

⁷ For example, those who were categorized into the Alarmed segment chose higher value answers overall such as “extremely worried” or “extremely sure”, those in the Concerned chose slightly lower value answers overall such as “very worried” and so on. Except for a couple, most questions reflected this pattern.

indicating the mean value obtained for each question by segment type (i.e. answers that follow a numerical scale), or a frequency chart (i.e. answers that cannot be measured). This will provide better insight into how beliefs and concerns are distributed across segments.

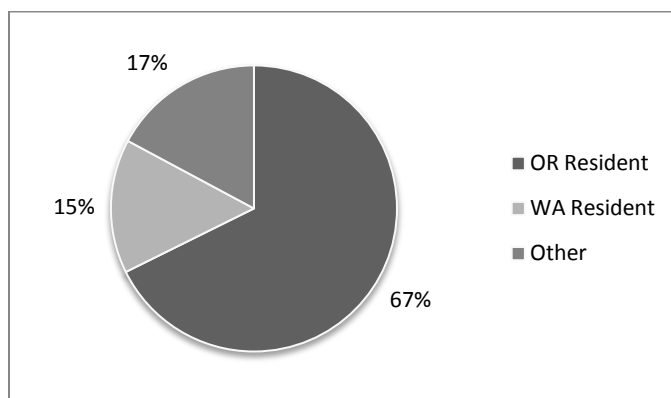
Results

Following an overview of the participant demographic data, results of the study are broken into four sections. The first summarizes how visitors were distributed among the “Six Americas” segments and how these distributions compared among sites. The data from the national study are then compared to these results to see if there are any significant differences. For a deeper insight into visitor attitudes, data from the individual questions asked on the survey is also provided and in some cases, are compared to the national data as well. Finally, demographics are explored in more detail to see if there are any correlations with segment type.

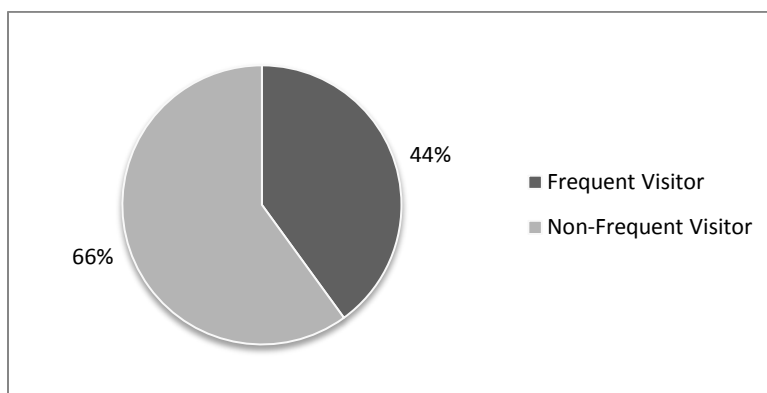
Participant Demographics

Approximately 100 visitors completed the questionnaire at each site for a total sample size of 300.⁸ Of these, a large majority (83%) were residents of the Pacific Northwest (Oregon, Washington, Alaska, and British Columbia), with 67% from Oregon alone. Almost all (99%) were U.S. citizens (See Figure 2).

⁸ The number of visitors who participated was actually 312. Incomplete surveys were not counted in the sample because all questions needed to be answered to conduct the segmentation analysis. The researcher noted these each collection day and recruitment numbers were adjusted to meet the goal of 300.

Figure 2: Visitor Demographics (Residency), N=300

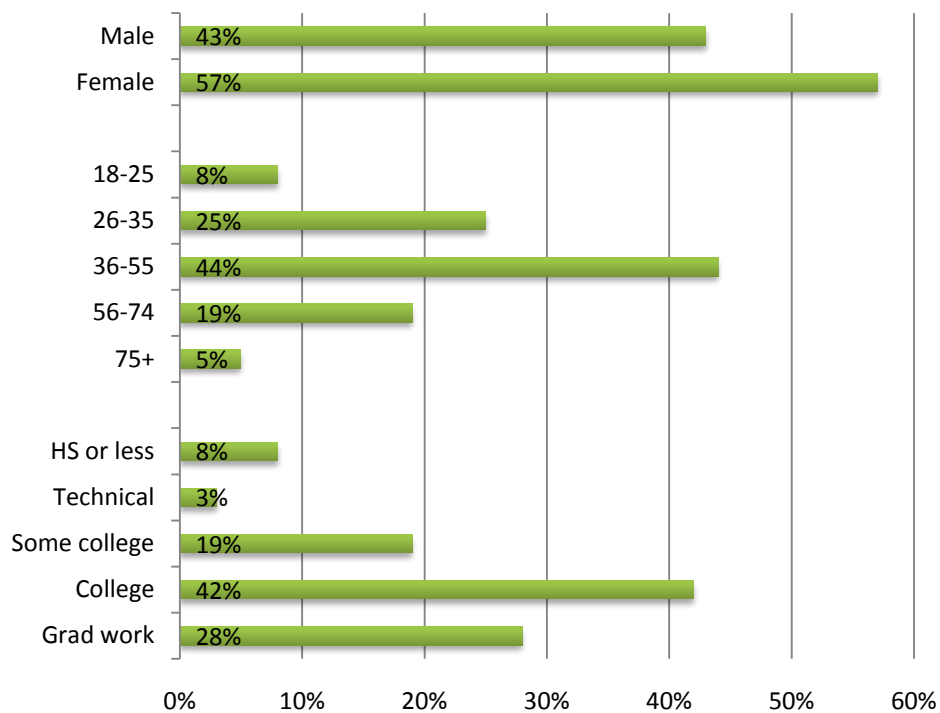
There were only minimal differences between participant demographics between sites with the exception of the number of return visitors. The majority of participants at the zoo (63%) indicated that they had visited more than once in the last year, while returning visitors were the minority at both the aquarium and science center. Across sites, a total of 44% indicated that they had visited in the last year.

Figure 3: Visitor Demographics (Frequent vs. Non-Frequent Visitor), N=300

Given the relatively consistent demographics across the sites, the figure below summarizes the total sample characteristics including sex, age, and educational attainment (N=300) for comparison to the national sample (Figure 4). The total demographics of the visitor sample for

each segment type can be found in Appendix B. Site-specific demographics will be provided for each participating facility in separate documents.

Figure 4: Visitor Demographics (Sex, Age, Education), N=300



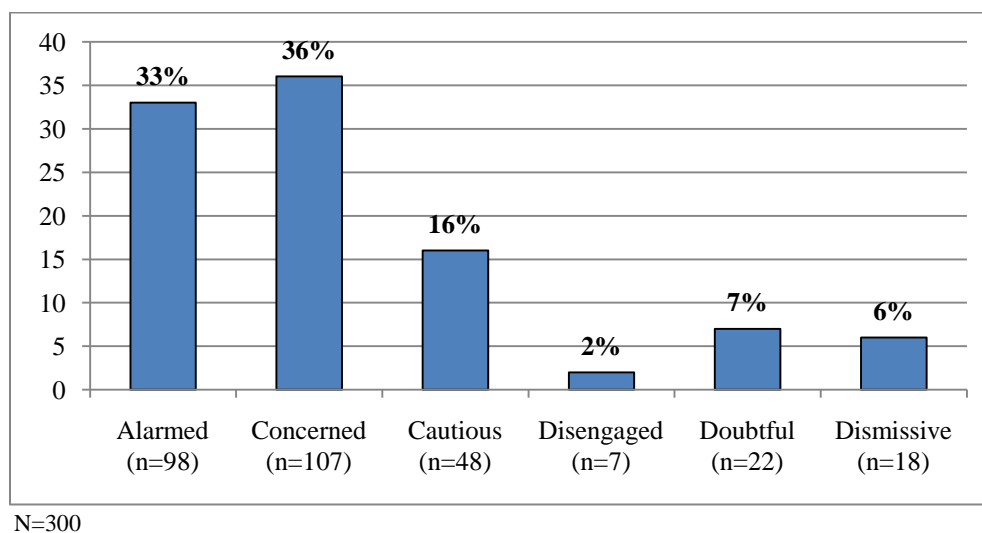
The graph above shows the sex, age range, and education level proportions of the sample.

The majority of participants were female (57%) and between the ages of 36 and 55 (44%). Most participants had a college degree or higher (70%). These numbers are similar to other studies conducted at these sites. Nickels (2009) also found that the majority of visitors at the aquarium and Hatfield Marine Science Center were female, highly educated and between the ages of 31-60. A study by Hodak (2008) at both the science center and aquarium found that the majority of participants also had a college degree or higher (64%) and data from a 2006 survey at Hatfield Marine Science Center had an even higher majority (76%).

Segment Distribution across Sites

Visitors' perceptions of climate change were assessed for both the sites and across the entire study sample. Participants were placed into one of the six segment types based on the questionnaire data. The distribution for the total sample (N=300) is shown in the figure below.

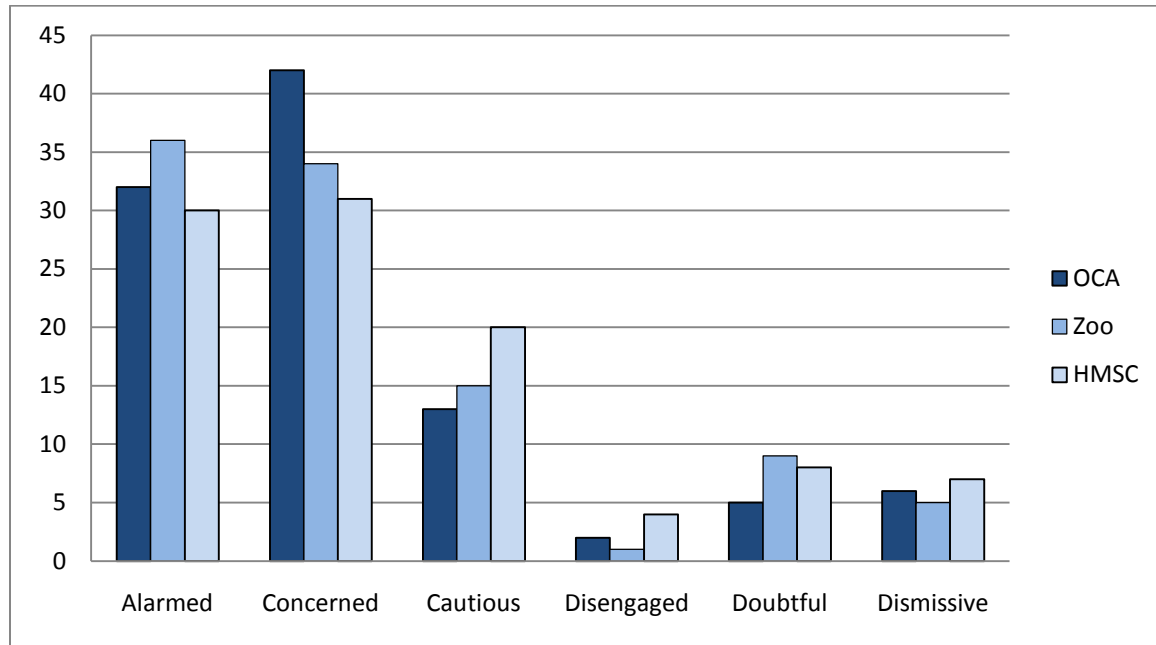
Figure 5: Percentage of Visitors in each Segment across Sites



As shown in Figure 5, there were differences in the proportion of the sample that fell into each segment. Of the 300 participants, over two-thirds were categorized as either Alarmed or Concerned (69%). The segments at the other end of the spectrum, the Doubtful and Dismissive made up a much smaller percentage of the population (13%). The largest segment was the Concerned, followed closely by the Alarmed. The Disengaged was the smallest segment with only 7 participants falling into this category across the sites.

Inter-site samples were also analyzed to see how distributions of segment types compared among the sites. Sample size was the same for each of the study sites (n=100). Figure 6 shows the percentage of visitors in each segment at the Oregon Coast Aquarium (OCA), Oregon Zoo (Zoo) and Hatfield Marine Science Center (HMSC). The exact numbers are given in Table 1.

Figure 6: Comparison of Segment Type Distribution within Sites



Total: N=300; Site: N=100

Table 1: Segment Percentages at each Site

<i>Study Site</i>	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Dismissive
OCA	32	42	13	2	5	6
Zoo	36	34	15	1	9	5
HMSC	30	31	20	4	8	7

Total: N=300; Site: N=100

Although Figure 6 shows slight variations between the sites, the difference was not significant $\chi^2(10, 300)=7.28, p =.699, V=.11$. Overall, the segment distribution of participants at all three sites was similar, with the Alarmed and Concerned contributing to the largest proportion of the samples. Nearly three-fourths of the visitors at the Zoo and OCA were in these two segments. HMSC had slightly less (61%) with a larger percentage of visitors categorized as Cautious (20%)

than the other sites. The zoo was the only site with the majority of its sample in the Alarmed.

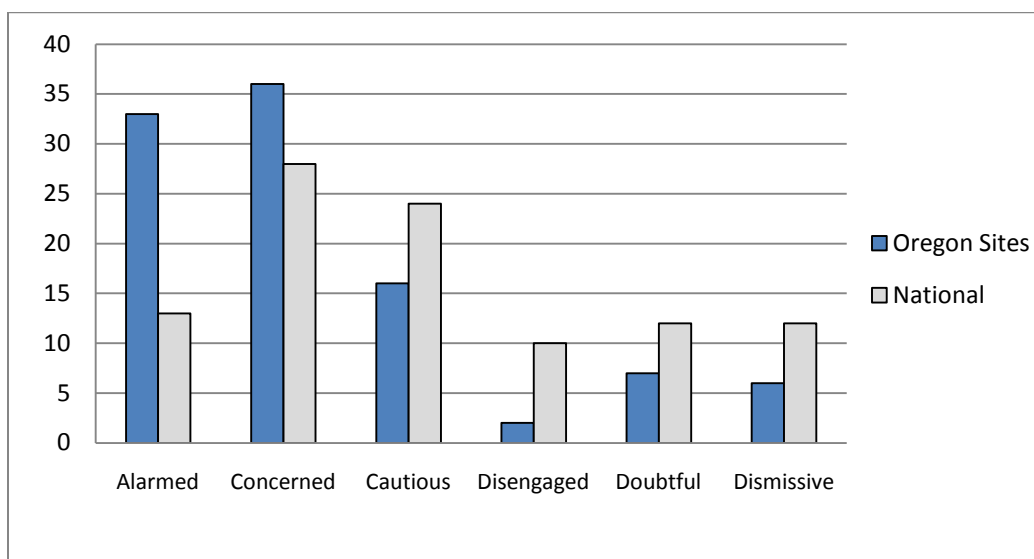
Both OCA and HMSC's visitors made up more of the Concerned, but not by much.

At all three sites, the distribution of visitors in the Disengaged, Doubtful, and Dismissive segments was also similar. The Disengaged was the smallest segment across sites. None of the sites had more than four visitors in this category. Visitor numbers remained low for both of the remaining segments and made up less than one-tenth of each sample.

Segment Distribution Compared to the American Public

The segmentation analysis for the project was based on the same methods utilized by the national "Six Americas" study. Because of this, the total segment distribution of visitors across the three study sites (Oregon sites) was compared to the results of the general American public (National) (see Figure 7; Table 2). Due to the lack of raw data from the national study, statistical tests were not able to be conducted to determine if any differences were significant. Therefore, descriptions of general trends in the data are summarized.

**Figure 7: Comparison of Segment Type Distribution:
Oregon Sites vs. The National Sample**



Oregon: N=300; National: N=1,024

Source (national data): Lesierowitz et al., (2010)

**Table 2: Percentage of Participants in Each Segment:
Oregon Sites vs. National**

<i>Sample</i>	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Dismissive
National	13	28	24	10	12	12
Oregon Sites	33	36	16	2	7	6

Oregon: N=300; National: N=1,024

Source (national data): Lesierowitz et al., (2010)

There seems to be a difference in the general distribution of people in each segment type between the informal science center sample and the American public as a whole. While the Oregon visitor tended to cluster toward the left end of the spectrum in the Alarmed and Concerned segments, the general public was much more spread out among the segment types. Only 41% made up the Alarmed and Concerned compared to 69% of the visitor sample.

The most noticeable difference between both samples is in the Alarmed segment. The proportion of those that were classified as Alarmed at the Oregon sites (33%) was more than twice that of the national sample (13%). The samples also differed in the number of people who were placed into the Doubtful and Dismissive segments: about a quarter (25%) of Americans compared to 15% of visitors. Finally, the national sample contributed to larger percentages of both the Cautious and Disengaged.

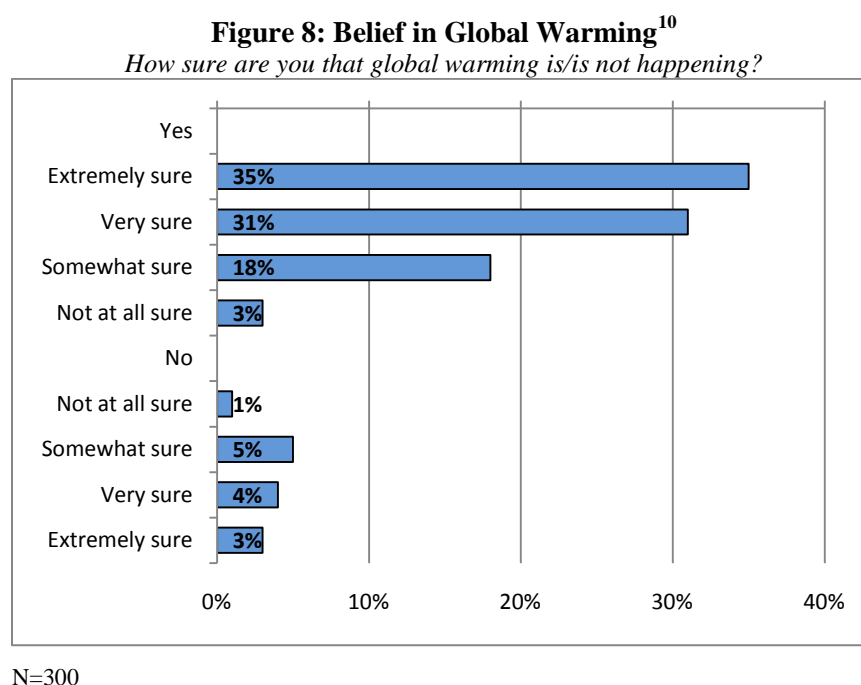
Some similarities also emerge out of these comparisons. Both samples had the highest percentages in three segments: Alarmed, Concerned and Cautious (although Alarmed was still small for the general public). The largest segment for both was the Concerned (28% and 36%) and the smallest was the Disengaged (10% and 2%).

Perceptions of Climate Change

To gain a better understanding of participants' beliefs and perceptions regarding climate change and how they differed from the national study, answers to the individual survey questions were also analyzed. This section summarizes the responses to each question and how they compare across segment types. Frequency tables and mean value graphs are provided in Appendix C for a more detailed review. Due to the similarity of segment distributions between the sites, separate site-specific question data was not included.⁹ The results that follow reflect the entire visitor sample (N=300).

Beliefs

When asked whether they thought global warming was happening, an overwhelming majority of visitors said yes (83%). Only one-tenth (11%) said that they did not believe that it was occurring, with a small percentage (6%) not sure at all. Certainty of belief is shown in Figure 8.



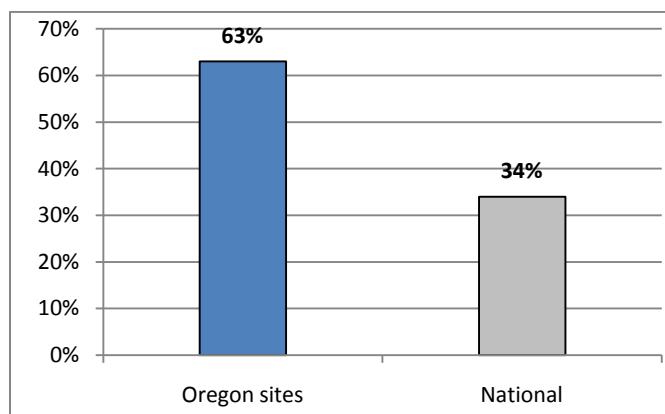
⁹ Individual question data from the all three samples will be provided for the study sites at a later time.

¹⁰ These percentages exclude the participants that answered "I don't know" to this question.

In comparison, the national study also found that the majority of the national sample believed in global warming, but this was a smaller proportion (61%) , with 34% indicating they were either sure of very sure that global warming was happening. Figures 9 shows this comparison.

**Figure 9: Belief in Global Warming
Oregon Sites vs. National**

Percentage that said they were *very sure* or *extremely sure* that global warming is happening



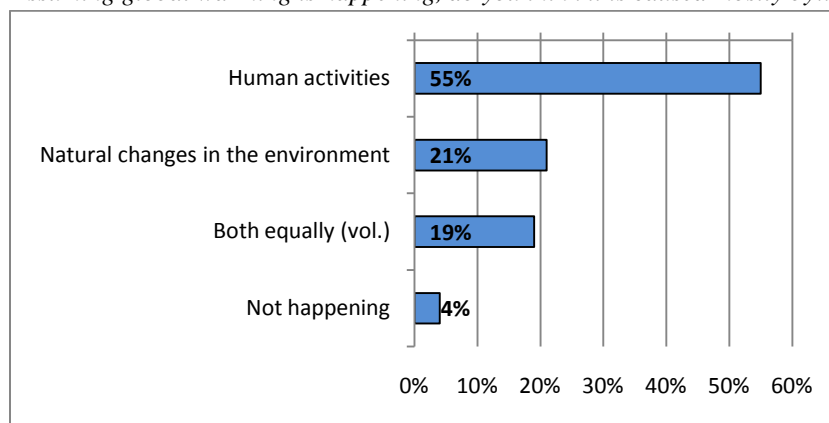
Oregon: N=300; National: N=1,024

Source (National data): Lesierowitz et al., (2010)

About half of the visitors believed that global warming was caused mostly by human activities (55%). The segment most likely to believe this was the Alarmed (82%). The Cautious, Disengaged and Doubtful were more likely to think it was caused by natural changes in the environment and the Dismissive were most likely to think it was not happening at all (50%) (see Appendix C, Question 3).

Figure 10: Cause

Assuming global warming is happening, do you think it is caused mostly by...



N=300

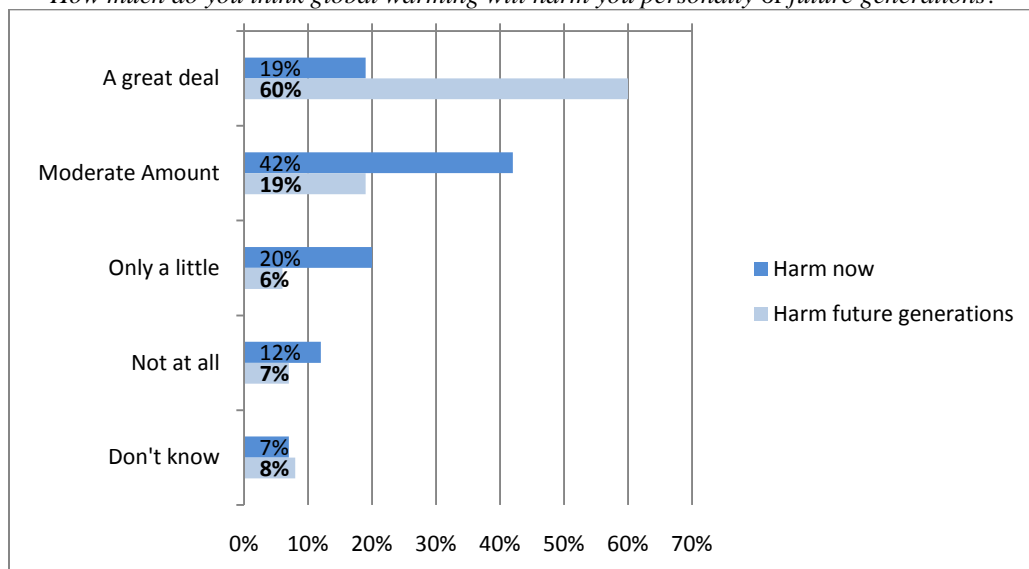
The national study also found that half of the American population attributed global warming mainly to human activities (50%). However, the general public was more likely to believe that global warming was caused by natural changes than the Oregon sites (35%).

When asked when they believed global warming would start to harm people in the U.S., half (50%) of the visitors said it has already begun to harm people, while 26% said it would start in the next 10 to 20 years. The segments most likely to think this were the Alarmed, Concerned and Disengaged. The Cautious were divided in their opinions and most of the Doubtful said that if it did start to harm people, it would not be for another 50 years or more. Nearly all of the Dismissive (89%) believed that it would not start to harm people until 100 years or not at all (see Appendix C, Question 6).

In questions 5 and 7 on the survey, visitors were also asked whether they thought that global warming will harm them personally and how much they believed it would harm future generations. The results from these questions are compared in Figure 11.

Figure 11: Impacts

How much do you think global warming will harm you personally or future generations?



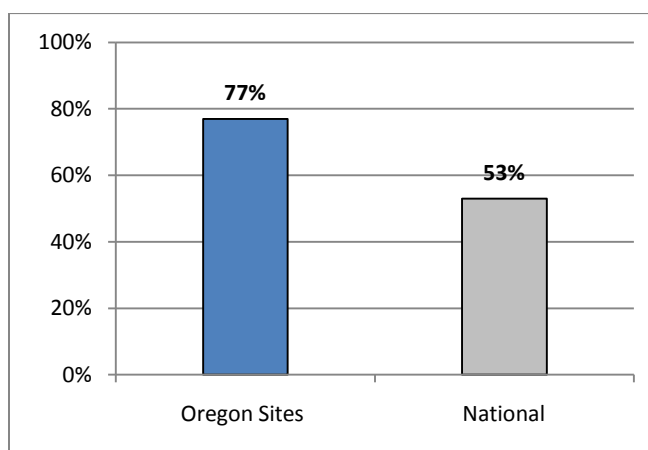
N=300

Figure 11 shows the percentage of visitors who thought that global warming would harm people either a great deal or a moderate amount varied between whether the question regarded them personally or future generations. Many more visitors (60%) believed that global warming would harm future generations a great deal than them personally (19%). They were much more likely to say that it would harm them only a little or a moderate amount (62%). While the Disengaged were the most likely to say they did not know, this pattern persisted among the most of the segment types. The exception was the Dismissive. While all believed that it would not harm future generations, 12% indicated that they thought it would harm them personally (see Appendix C, Questions 5 and 7).

Level of Concern

Most visitors said that they were worried about global warming (77%), thought about global warming at least some before their visit (84%), and indicated that it was at least somewhat important to them personally (82%). Figures 12 through 14 compare these beliefs to the general American public.

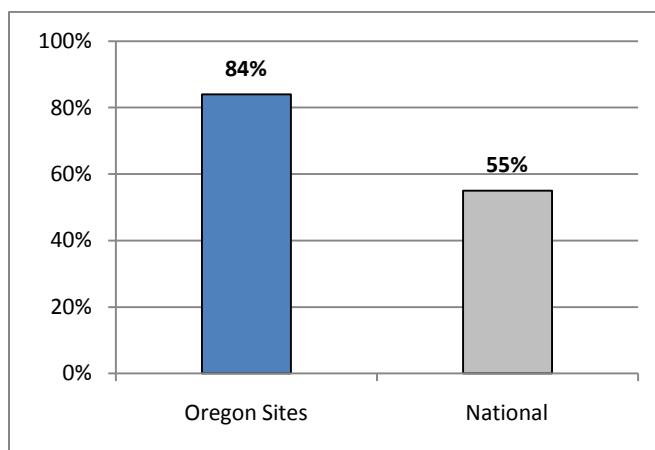
Figure 12: Worry
Oregon Sites vs. National
 Percentage of those that said they were *at least somewhat worried*



Oregon: N=300; National: N=1,024
 Source (National data): Lesierowitz et al., (2010)

**Figure 13: Thought
Oregon Sites vs. National**

Percentage of those that said they had *thought about global warming at least some* before their visit

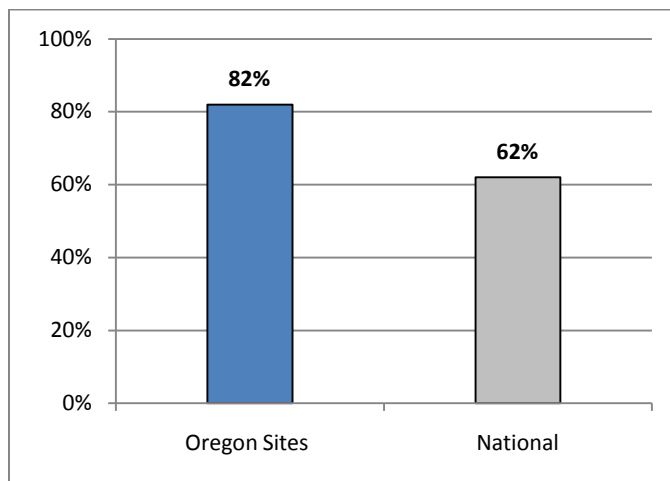


Oregon: N=300; National: N=1,024

Source (National data): Lesierowitz et al., (2010)

**Figure 14: Importance
Oregon Sites vs. National**

Percentage of those that said that global warming was *at least somewhat important to them*



Oregon: N=300; National: N=1,024

Source (National data): Lesierowitz et al., (2010)

There were also differences in the level of concern between segment types. This followed a near linear pattern across the segments. All of the Alarmed were worried, with 65% saying they were extremely worried, while all of the Dismissive said they were not very worried, if at all. There was a similar pattern between most segments when asked how important the issue of global

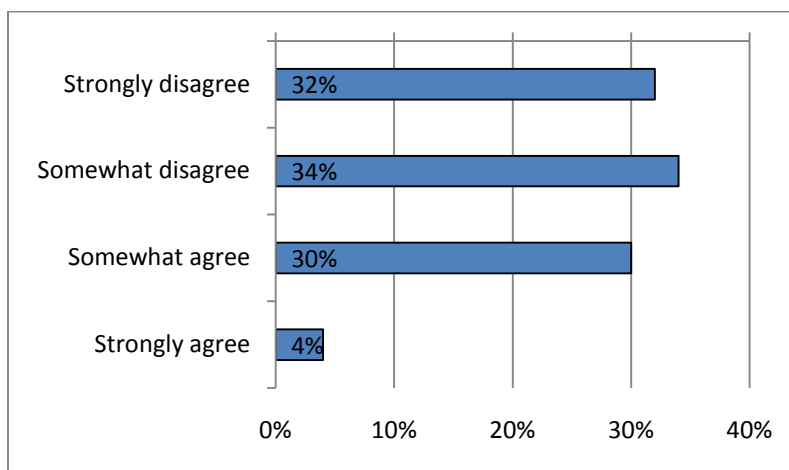
warming was to them. Nearly all of the Alarmed said that it was either very important or extremely important to them (98%). There was a difference, however, with the Dismissive. They varied much more than other segments across answers. While about half (55%) considered it to be not too important or not at all important, the other 45% indicated that it was at least somewhat important to them personally. The Disengaged also varied some on their answers.

The question that did not follow this trend was in regard to how much the participant had thought about global warming before their visit. The majority of both the Alarmed (99%) and the Dismissive (72%) said they had thought about it at least some, while only 43% of the Disengaged and 46% of the Doubtful said they had thought about it (see Appendix C, Questions 4, 7 and 9).

Certainty of Opinion

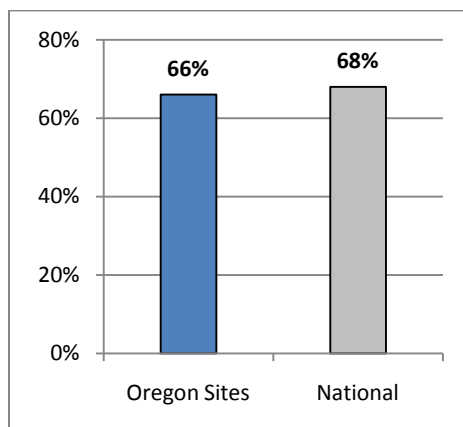
When asked how much they agreed with the statement “I could easily change my mind about global warming”, about two-thirds of visitors said that they disagreed (66%). The Dismissive and Alarmed both consisted of a similar percentage of the population who said that they strongly disagreed (67% and 62%). The Doubtful disagreed as well, but not as strongly as the previous segments. The majority of the Concerned also disagreed, but several also said that they could possibly change their minds (39%). The Cautious were the most likely to agree with the statement (71%) (see Appendix C, Question 10). In comparison to the Oregon sites, the American public held a similar view on whether or not they could change their minds. Most said that they disagreed with the statement (68%) which is almost equal to the proportion of the visitor population. Figures 15 and 16 show the percentage in each response for the overall sample as well as compared to the national data.

Figure 15: Certainty
"I could easily change my mind about global warming"



N=300

Figure 16: Certainty
Oregon Sites vs. National
 Percentage of visitors that they *disagreed* that they could change their minds about global warming

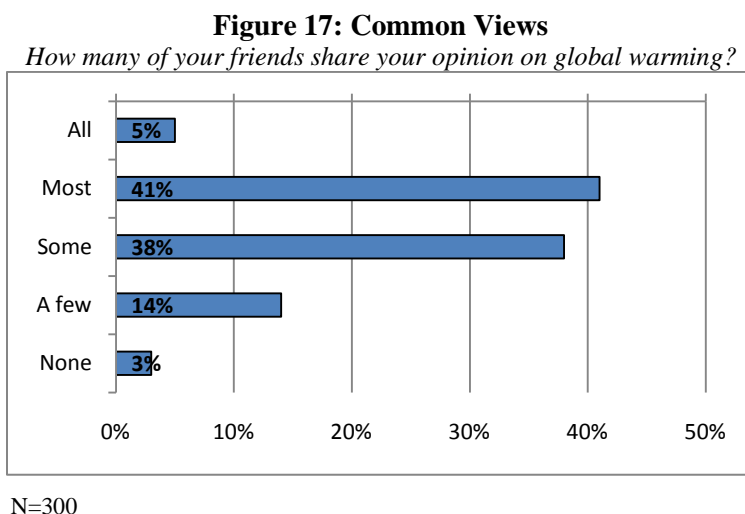


Oregon: N=300; National: N=1,024

Source (National data): Lesierowitz et al., (2010)

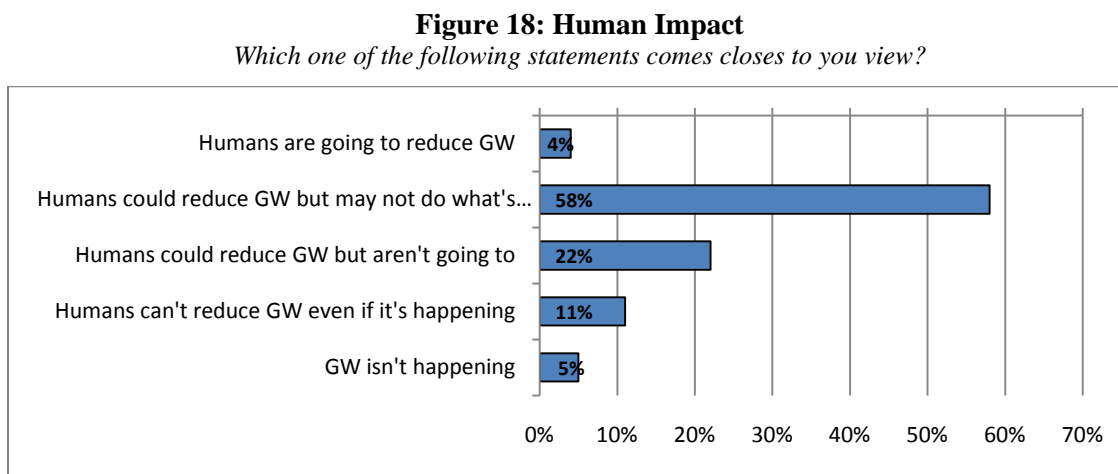
The questionnaire also assessed how much visitors thought that their friends agreed with their own views. Overall, visitors said that either some or most of their friends shared their views on global warming (79%), while only about 5% said all of their friends. The segment most likely to say that all of their friends thought the same way was the Dismissive (17%) with both the Alarmed and the Dismissive saying indicating that at least most of their friend do (69% and

67%). The percentages among the other segments were fairly distributed throughout the answer choices (see Appendix C, Question 11). Figure 17 shows the distribution for the total sample.



Behavior

Overall, visitors felt that humans could reduce global warming (84%) and that citizens should be doing more (79%). However, of those that said that humans could reduce global warming, the majority believed that it was unclear whether people were going to do what is needed or that people are not willing to change their behavior (see Figure 18). About half (51%) said that they had taken steps at least once in the last year to not buy products from companies opposing steps to reduce global warming.



N=300

GW= "global warming"

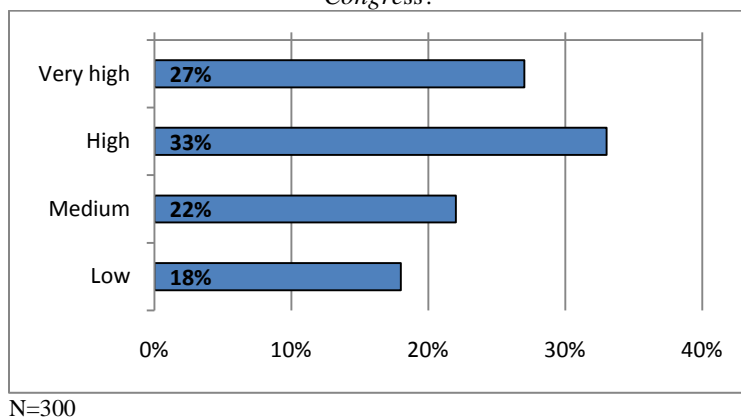
Issue Priority

Questions were also asked regarding visitors views on both citizen and governmental action.

When asked whether they thought global warming should be a high, medium, or low priority for the President and Congress, there were differing opinions between visitors. The majority (60%) said that it should be either high or very high (see Figure 19). The Alarmed (98%) and Concerned (77%) both felt that it should be at least somewhat of a priority, while both the Dismissive (89%) and Doubtful (82%) stated that it should be a low priority (see Appendix C, Question 15). Figure 20 shows the comparison to the national data.

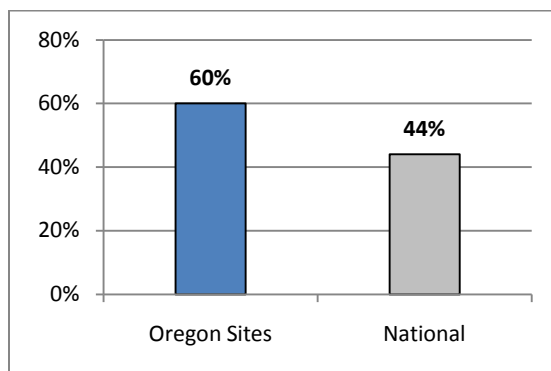
Figure 19: U.S. Priority

Do you think global warming should be a low, medium, high or very high priority for the President and Congress?



**Figure 20: U.S. Priority
Oregon Sites vs. National**

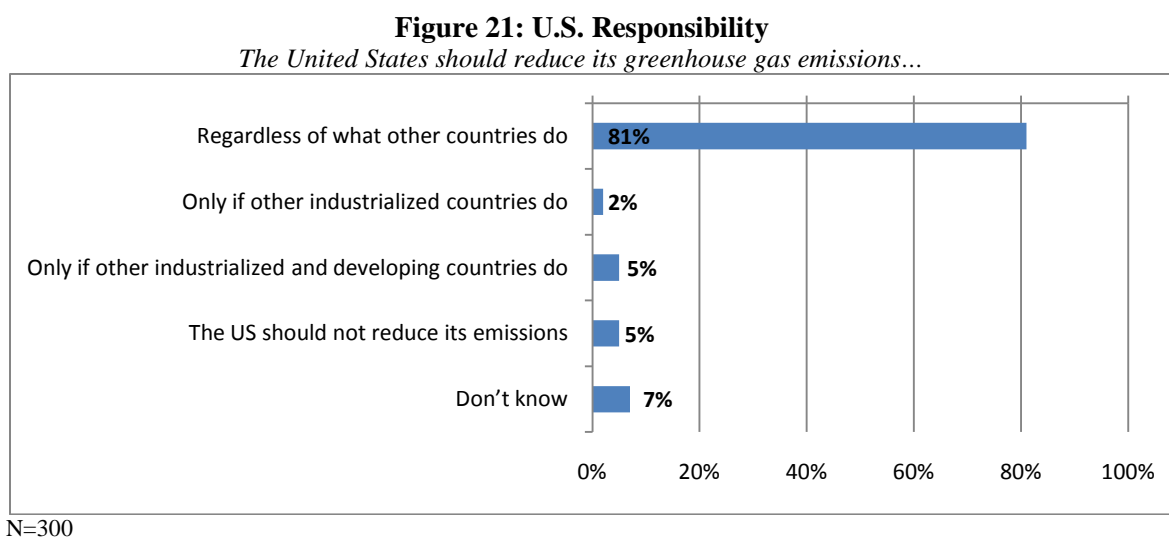
Percentage for those who thought global warming *should be a high to very high priority* for the U.S.



Oregon: N=300; National: N=1,024

Source (National data): Lesierowitz et al., (2010)

Another issue priority that was analyzed in the questionnaire was visitors' beliefs regarding the reduction of greenhouse gas emissions. The national report pointed out that worldwide, many people disagree whether the United States should reduce greenhouse gas emissions on its own, or only if other countries do as well. Visitors were asked their view on this and the results showed that a large majority (81%) do believe that the U.S. should reduce emissions regardless of what other countries do (see Figure 21).



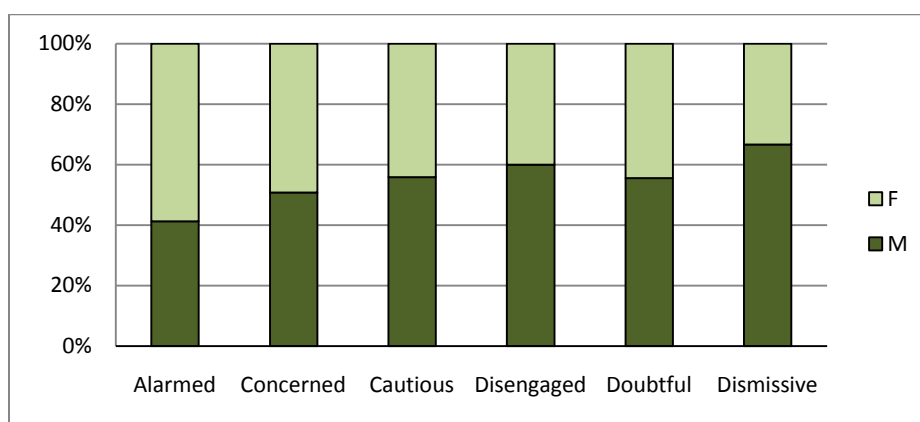
This compares to 65% of the national sample. For all segments, this was the most common answer, except for the Dismissive who were divided equally with the answer that the U.S. should not reduce emissions at all (see Appendix C, Question 16).

Demographic Differences among Segments

The final goal of this study was to assess whether there were any relationships between the demographics of the visitors and their segment type. Analysis was conducted across sites for this due to the similarity of demographics at each site (N=300). The following paragraphs summarize these findings (also see Appendix B).

The first demographic that was measured was visitor sex. Figure 22 shows the proportion of males to females in each segment. Chi-square analysis found that there were no significant differences between males and females across segment types, $\chi^2 (5, 300)=7.13, p=.211, V=.154$. However, the figure indicates that there may be a potential trend in the data. The majority of the Alarmed was female (65%) while most of the Dismissive was male (61%). More data would need to be collected in order to see if this pattern persists.

Figure 22: Sex and Segment Type
The proportion of males to females in each segment



N=300

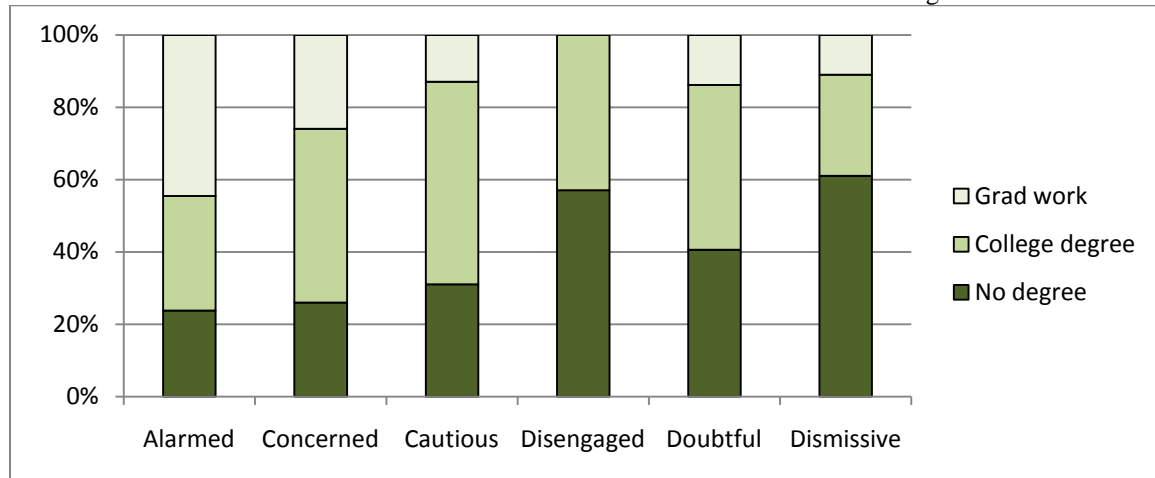
To conduct the analysis on the age demographic, the six age ranges listed in the description of the study participants earlier in the report was recoded into three groups: under 35, 35-55, and over 55. Like sex, there were no significant differences in the age range of visitors across segment types, $\chi^2 (10, 300)=7.28, p=.70, V=.11$. In addition, whether a visitor had been to the site in the last year also showed no significant difference, $\chi^2 (5, 300)=6.18, p=.29, V=.14$. Although Oregon visitors seemed to make up the majority of those in the Alarmed and Concerned segments, the number of questionnaires collected from visitors who came from other states was too small to conclude that there were any differences, $\chi^2 (5, 300)=6.5, p=.26, V=.13$ (see Figure 2)

In contrast to the other visitor demographics, educational level was found to be of interest.

Similar to age, education level was also recoded into three categories for statistical purposes: no degree, college degree, and graduate work. Differences in educational level across segments were significant, $\chi^2(10, 300)=37.39, p=6.28 \times 10^{-5}, V=.25$ (see Figure 23; Table 3)

Figure 23: Education Level and Segment Type

Distribution of visitors with a certain educational attainment in each segment



N=300

Table 3: Education Level and Segment Type

The percentage of those with a certain educational background in each segment

Education Level	Total	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Dismissive
No degree	30	24	26	31	57	41	61
College degree	42	32	48	56	43	46	28
Graduate work	27	45	26	13	0	14	11

N=300

The differences across segments are shown in Table 3 above. Visitors who had completed graduate work made up nearly half of the Alarmed and a quarter of the Cautious, while they only contributed to a small percentage of the other segments. Those who had not received a college degree contributed to the majority of both the Disengaged and the Dismissive and a large percentage of the Doubtful.

Discussion

While previous studies of visitor populations at informal science centers in Oregon have measured what people know and how they think about the topic of climate change, this project took on a slightly different approach. Audience segmentation analysis was utilized at three separate sites to see how those perceptions were distributed throughout the sites and between other populations. Across the 300 participants that were involved in this study, the results demonstrate that visitor audiences consist of a variety of voices who respond to climate change issues and solutions in fundamentally different ways. In an attempt to provide further insight into this and answer the original questions posed by this report, the section headings below present some key findings from the visitor survey.

A large majority of visitors across the informal science facilities believe that climate change is happening and is an issue of concern

Overall, participants at all three study sites show a high level of concern about climate change. An overwhelming majority state that they believe it is happening and fall into one of two segments: the Alarmed or Concerned. The “Six Americas” report describes these segments as the most likely to be worried and consider it of personal importance. This is also reflected in the questionnaire results. Most visitors expressed that they are worried about potential impacts of climate change, think about it often, and indicate that the issue is important to them.

These findings are similar to the results of another study that utilized the “Six Americas” segmentation analysis to examine informal science audiences. Led by the Association of Science-Technology Centers (ASTC), the study was conducted in eleven participating facilities across the U.S. It too found that a large majority of visitors to the sites were sure that climate change was happening and were concerned (McCracken, 2009). In addition, the recent NWZAA study at both the Oregon Coast Aquarium and the Oregon Zoo found that over half of the visitors

surveyed were personally concerned about climate change impacts, particularly those related to threats on wildlife and sea level rise (NWZAA, 2010)

A possible explanation for this high level of concern may lie in understanding the type of individuals who visit zoos or aquariums. Research shows that visitors to these types of facilities tend to be both knowledgeable and interested in conservation-related issues, and bring with them a higher than average understanding of ecological concepts (Dierking et al, 2002; Falk et al, 2007). Furthermore, the “Six Americas” study itself found that people categorized into the Alarmed and Concerned groups were more likely than other segments to pay attention to environmental issues, seek out environmental information, and actively engage in programs involving science and technology in their daily lives (Leiserowitz et al, 2009). Thus, a reason for the large number of visitors in these segments may have to do with this preexisting tendency to seek out conservation-oriented experiences and reinforcing activities. Perhaps people who fall into the Alarmed and Concerned groups are more likely to visit zoos, aquariums, and science centers in the first place.

Another intriguing finding from the visitor survey was that although there was no significant difference in the distribution of segment types between sites, the Oregon Zoo did have a slightly higher percentage of the sample categorized in the Alarmed. Further analysis indicated that the majority of these visitors were from the Portland metro area.¹¹ Ironically, Portland was one of the first cities in the U.S. to address the issue of climate change and the first to develop a local plan. In 1993, the city launched a campaign to reduce greenhouse gas emissions. Today, city officials encourage citizen action by developing city-wide cycling paths and tax-credits for energy efficiency in homes and businesses. In addition, the residents of Portland contribute to the highest recycling rate in the U.S. While there are a myriad of factors that influence peoples’

¹¹ Yet, there was no significant difference found between Oregon residents and other states. A larger sample size would need to be obtained to determine if this remained true for other studies.

beliefs and concerns about climate change, it would be interesting to see whether simply living in the Portland area contributes to a higher percentage of concerned citizens. What affect, if any, this had on the visitor data is unknown.

An alternate perspective that should be noted for the high level of concern among visitors comes from the notion that certain people tend to be more “risk sensitive” than others, prone to taking alarmist positions not only with climate change, but also with several other environmental and cultural issues. Some scholars have suggested that modern U.S. society is marked by a “culture of fear”, with more people worried about remote apocalyptic scenarios, regardless of their engagement with or knowledge of the issue (Furedi, 2002). In this view, many alarmists may simply indicate they are worried about climate change because it is in their nature to do so and not necessarily because of the topic itself. It is unknown whether the participants placed into the Alarmed or Concerned groups fall into this alarmist category, but this possibility should not necessarily influence the way that facilities communicate with these visitors. They are the groups most likely to engage in exhibits and activities related to climate change regardless. However, the most effective messaging for alarmists may come from emphasizing an obtainable future through personal action to curb any potential feelings of fatalism or hopelessness.

Visitors to the informal science facilities reflect a more concerned audience regarding climate change than the general American public

The level of concern among participants at the three informal science centers is considerably higher than the results of the nationwide “Six Americas” study. The percentage of people who are categorized as Alarmed in the study sample is over twice as large as the percentage in the national sample. Similarly, the percentage of people making up the “unconcerned” segments (Doubtful and Dismissive) is much smaller than the national sample.

Across segment types, there is also a large difference between the two samples regarding beliefs on whether climate change is happening. Nearly twice as many visitors are sure that it is happening than the general public. In contrast, however, there is not a considerable difference between samples concerning the cause of climate change, except that more visitors were likely to voluntarily choose both human and natural causes equally. Perhaps the distributions would have been different if this voluntary answer was not included.

These findings also concur with the ASTC study and are not too surprising. It has been suggested that, on average, visitors to free-choice learning facilities such as science centers are generally more concerned about issues related to conservation than the general public (McKelvey et al, 2009). As discussed above, this suggests that even though visitors vary in their beliefs and attitudes, the nature of the science center may attract a certain type of person who is likely to be at least somewhat informed and interested in conservation issues such as climate change. In addition, while a survey by the Ocean Report (2010) did not find that there was any significant difference between informal science center visitors and the public as a whole about environmental issues, the one exception regarded climate change opinion. The American public as a whole placed it much lower on a list of environmental issues in the U.S.

The small number of disengaged visitors at the sites compared to the national study is also of interest. The Disengaged are the most likely to not know the causes, consequences, or impacts of climate change to themselves and future generations. The national report indicated that this segment accounts for a tenth of the population, whereas at the study sites, only seven people in total are categorized in this segment. The study by McKelvey et al (1999) discussed above indicated that people who visit informal science centers tend to be more knowledgeable about conservation issues than the population as a whole. Considering the high level of educational attainment by the visitors in the sample, this characteristic of informal science audiences may have contributed to the smaller percentage of Disengaged at the sites. Further, the national study

found that the demographics of this segment consisted mainly of minority populations. Very few participants in the visitor survey were minorities.

There is a small group of visitors at each site who have a tendency to believe that climate change is not happening, are not concerned and are unlikely to change their minds

About 13% of the visitor sample can be defined as Doubtful or Dismissive, the two segments that are the least concerned about the topic of climate change. While this number is small at each study site, it is important to understand who they are for facilities to address their unique concerns, beliefs, and priorities. Visitors placed into one of these two segments are the least worried about climate change of all the segments, and according to the “Six Americas,” some even take action against mitigation efforts. The Dismissive are the least likely to change their minds on the issue and are generally very knowledgeable. Although they have thought often about climate change, they are not concerned about it at all. The national study found that this group has a tendency to see climate change as a topic of much debate in the scientific community and generally do not trust scientists as much as they trust friends and family. They are also unlikely to trust environmental organizations (Leiserowitz et al, 2009). Moser and Dillings (2007) discussed how people with these types of perceptions can also often have strong attachments to their own preexisting worldviews regarding the global climate (e.g. climate change is a “hoax” or purely a natural phenomenon). Given all these factors, visitors to informal science centers who hold these views may tend to reject information that contradicts their beliefs. Thus, while the proportions may be small, this group of visitors may be the most difficult to engage.

It is important to note that a portion of these two segments actually do think that climate change is happening. The visitors who think this are most likely to fall into the Doubtful, though nearly all believe that it is caused by natural cycles and humans have no impact (65%). The NWZAA study found that some visitors, who believed it was happening, but were still largely unconcerned, felt that the issue was overemphasized. They further pointed out that although visitors were not

concerned about climate change in general, many were still interested in other environmental (wildlife) issues (NWZAA, 2010).

Views on the potential cause of climate change are mixed

Similar to the national study, visitors to the informal science centers differ on their opinions of the underlying cause of climate change. About half the visitors believe that it is caused by human activities, whereas the other half is divided between natural causes and both causes equally. The Alarmed and Concerned are the most likely to think climate change is related to human actions. Many who believe this have already taken action in their daily lives and think that both the U.S. government and citizens should be doing more to address it. Those that feel climate change is caused by natural changes are mainly distributed among the Cautious, Doubtful and Disengaged. The Dismissive are the most likely to say it is not happening at all.

This variation of beliefs may be attributed to the wide array of sources communicating climate science worldwide. From new scientific findings to the media and government, the discourse on climate change is often polarizing and confusing. Even credible scientific sources can be misleading with complex terms and models. Bostrom et al (1994) found that many people had misconceptions about the causes of global warming. They showed that a large proportion of people were confused on the difference between weather systems and global climate change, and others thought that the solution to reducing greenhouse gases was simply to stop using aerosols or to buy a new car. They also emphasized that understanding these misconceptions is vital for communication efforts. Thus, while most visitors say that they think climate change is happening and that people should be doing more, they may hold misleading ideas of both causes and solutions that could influence communication.

Many visitors feel that people should be doing more to address the impacts of climate change and may already be taking action

The majority of the visitors think that the U.S. President and Congress should be doing more to address the impact of climate change and that citizens themselves should be taking action. Even the Disengaged share this view. The Doubtful and Dismissive are the only two segments to say that Americans should be doing less than they are right now, but this was a very small percentage of the total sample. Regarding action by the country as a whole, an overwhelming majority of visitors say that if climate change is happening, the U.S. should reduce its greenhouse gas emissions regardless of other countries. Many are also already taking action in their daily lives by refusing to buy products from companies who oppose taking steps toward reducing climate change.

Even with these findings, there are still some barriers that keep some segments from making a specific behavior change. Most of the sample and nearly all of the Alarmed believe that humans could reduce climate change impacts, but many think that humans will not succeed or do what is needed. According to the “Six Americas” study, many of the concerned citizens think that people can make a personal difference, but will have to make major changes in their lives. Even the Alarmed said that one barrier was their lack of knowledge about who to contact or what companies to avoid. The Concerned and Cautious in the national study were most likely to say that they needed more information about solutions to take action (Leiserowitz et al, 2009). Thus, to encourage more action-oriented behaviors, educators would need to address these barriers, unique to each segment.¹²

One encouraging find from the national report was that for the Alarmed, Concerned and Cautious, the most trusted sources of information were scientists and environmental organizations. Since these are the largest of the segments in this project, it is likely that the majority of visitors has

¹² These are listed in more detail in “Global Warming’s Six Americas 2009” (Leiserowitz et al, 2009).

built a sense of trust for informal science institutions and would consider any climate change messaging regarding potential solutions to be credible

Education level attained may influence climate change attitudes among visitor audiences

While the sex and age range of visitors are similar among segments, the difference among education levels is considerable. Almost four out of five visitors who are categorized into the Alarmed have a college degree or higher and nearly all of the Concerned and Cautious have at least some college education. In contrast, over half of the Disengaged and Dismissive indicate that they have not attained a college degree. Most of the Doubtful said that they have at least been to college, but about a quarter have not.

The national study found a somewhat different distribution in terms of education level. While the majority of the Alarmed also stated that they had a college degree or higher, most of the Doubtful and Dismissive indicated that they had a higher than average educational background as well. The one segment that was similar was the Disengaged, with the majority in both the national and visitor samples only completing high school. Several studies have concurred with the national study when examining conservation-related attitudes or environmental priorities, including a recent PEW Research Center report which found that higher education was linked to greater skepticism of the potential threats of climate change, at least among conservatives (PEW, 2007). Therefore, it is unclear at this point why educational levels are much lower for the unconcerned segments in the visitor sample.

This key finding may provide an additional reason for the large number of visitors in the Alarmed segment across sites. In comparison to 2009 U.S. Census Bureau statistics for educational level, nearly three times as many visitors in this study (70%) had obtained a college degree or higher than the American public as a whole (27%). Although this seems like a high percentage

compared to the general population, previous studies have also found that this seems to be characteristic of all three of the sites (see Gerkhe, 2007; Hodak, 2008; Nickels, 2008). Since the informal science visitors tend to have a more extensive educational background, according to the results, a large portion of the sample is also likely to be Alarmed.

It is important to briefly mention another demographic that was not found to be a significant factor in segment placement, but did show an interesting pattern. The proportion of males to females in all the segments except the Cautious and Doubtful was varied. Both the Alarmed and Concerned consisted of more females, whereas the Disengaged and Dismissive contained more males. This is similar to the national study, which found that well over half of the Doubtful and Dismissive were men with the women mainly in the Alarmed and Concerned. The only segment that was different was the Disengaged. In contrast to the national sample, this segment contained a smaller percentage of women. More research would be needed to see if there are any consistent significant differences between segments regarding gender.

Conclusions

Visitors to the Oregon Coast Aquarium, Oregon Zoo, and Hatfield Marine Science Center generally believe that climate change is happening and are much more concerned than the American public as a whole. In addition to these findings, segmentation analysis indicates that understanding visitors' underlying perceptions of climate change is a complex process and involves more deep examination than the analysis of demographic data alone. Emphasized by the "Global Warming's Six Americas" study, the perceptions held by each audience segment will ultimately have a direct impact on the way that visitors respond to climate change messaging, including science and solutions. Determining the interests, behaviors, and preferences of each group will help to create more powerful and engaging learning experiences for a variety of visitor

audiences at each of the participating facilities. Through this process, the sites will hopefully come one step closer to meeting the NWZAA goal of citizen action.

Implications for the Informal Science Facilities

The key findings from this project hold several implications for the study sites. Effective communication begins with understanding how these can apply to informal science exhibits and programs. The major implication for the sites is a recommendation that has been made by many visitor studies. It is imperative to know the audience. While segmentation analysis resulted in a slightly skewed sample of more concerned visitors, there was still much variation across each group. Without this knowledge, there is no way to know what educational tools would work for the majority of visitors or how to best engage each group. Furthermore, as Falk et al, (2007) found, educators cannot accurately measure the success of any one exhibit on attitude change if these prior segments are not known.

From this analysis it becomes clear that there are a variety of audiences within each site that think about climate change in different ways. Since informal science facilities reach a wide range of people annually, they have a unique opportunity to educate and inspire all segments through exhibits and activities. Gearing these projects to the different segments will lead to more effective communication overall, for each has its own interests and needs.

Because it is difficult to identify what segment characterizes a particular visitor within a site, one way to provide effective messaging is through exhibits that contain multiple entry points that can appeal to visitors across all segment types. For example, this may include a design that focuses on the topic of climate change, but has several aspects, such as an interactive or media component emphasizing human solutions, coupled with an area dedicated to the specific impacts on local wildlife. Messaging at more than one established exhibit may also be effective in addressing the

needs of each audience. At the aquarium, for example, this could involve a trivia game about climate impacts on the ocean in one area and a more visually engaging model of sea ice loss in another. Holding workshops or occasional talks for the community may also appeal the more concerned audiences who wish to learn more about taking action in their own lives. These methods would allow people with unique interests and motivations a chance to engage in the type of learning that best suits their needs. In fact, this type of programming has already begun at the Oregon Zoo, which includes signs around the park, an exhibit on the impacts to polar bears, and a visual representation of how people can create a better backyard habitat in their own homes. It will be interesting to see how visitors respond to these projects.

The following paragraphs give a brief summary of the ways in which facilities can approach each segment when developing activities and exhibits with multiple entry points. These recommendations are based on the results of this study and are framed by the more detailed findings in the “Six Americas” study.¹³

- Alarmed and Concerned

According to the national study, both of these segments are the most likely to trust environmental organizations as a credible source for climate change education. They also make up the majority of the visitors to the three sites. It is for these reasons that informal science facilities may be able to make the largest impact on these groups in regard to action-oriented education. Along with being well-informed, these groups are also the most interested and worried. Therefore, projects should be aimed at providing more information on solutions, what individuals can be doing in their daily lives, and emphasize that one person can make an impact. Furthermore, because these segments are such a large percentage of the samples, potential solutions and individual actions should be included

¹³ See “Global Warming’s Six Americas 2009” for further recommendations on communicating with each of these segments (Leiserowitz, 2009).

with any messaging throughout the sites. These groups might also benefit from community workshops, resources and events focused on climate action.

- Cautious

The majority of the Cautious think that climate change is happening, but there are many who are not sure. They are also split on whether climate change is caused by natural changes or human activities. Most are somewhat worried, but unsure when climate change will affect people. Therefore, communication with this group will be most effective through messaging that is both informative and highly engaging. The Cautious may benefit the most through interactive, exciting exhibits that immerse them in the topic and provide credible information. Keep in mind that this is the group most likely to change their mind, so an effective exhibit here may positively add to their base of knowledge and help them make more informed choices in the future.

- Disengaged

The Disengaged tend to be the least knowledgeable about the causes, consequences and solutions to climate change, but many consider it to be at least somewhat important to them and think that people should be doing more. Climate change engagement with this group would need to involve information on each one of these aspects and how impacts relate to them and their daily lives. Most seem to be disconnected from the issue, but some do show concern. Thus, since they are probably less likely to seek out information themselves, informal science centers may be a good setting for them to acquire knowledge. Keep in mind, however, that this group was by far the smallest segment of all three sites. Facilities can therefore assume that most visitors know at least a little about climate change, but may still be able to engage this group by providing the same highly engaging or affective messages as with the Cautious group. This would include visual or interactive exhibits that provide sufficient stimuli to hold their attention.

- Doubtful and Dismissive

These two segments were combined because they represented such a small portion of the visitor sample. Both are least likely to be concerned or interested in climate change messages. Unlikely to change their minds, engaging these groups will be challenging. From the findings in the national study, these visitors tend to mistrust scientific information, and the Dismissive, in particular, may actively ignore any communication efforts. One way that educators may get the attention of these groups, however, is to focus on personal or local impacts and how their actions can help the environment as a whole. While not measured in the survey, a few of the people who fell into these groups mentioned casually that they supported helping endangered species and the environment overall, but simply did not think they should take action against an issue they were not sure existed. Perhaps, emphasizing the other benefits of conservation behaviors could aid in catching the attention of these visitors.

From this, it is clear that facilities need to create a variety of communication tools. But, how do educators know the most important information to share with the public when it comes to climate science? Furthermore, many visitors, including the Alarmed, come into facilities with a wide range of misconceptions about climate change that can impact their response to any solutions presented. It is important to remember that interest and concern do not always translate into accurate knowledge of the subject. A recent report was released by the US Global Change Project that described the six essential principles of climate science. Many organizations and educators are beginning to integrate these new “science literacy” principles into their education efforts. It may be of interest to the informal science facilities to integrate these principles into their education efforts to address some of these misconceptions and provide for more effective communication (see U.S. Climate Change Science Program, 2009).

Finally, this study also found that many people who are in the Doubtful or Dismissive segments represent only a small portion of the visitors at each site. As discussed earlier, this is perhaps due to the type of person that visits informal science facilities. Supplemented by similar research efforts, it does not seem that facilities can reach these individuals on a large scale within the sites themselves. Although some studies have suggested that the site provide outreach programs and workshops in the community to reach the unconcerned citizen, this project found that the Dismissive are the segment that has thought about the issue the most yet are also very unlikely to change their minds. It is unlikely that these groups will respond to outreach opportunities that contradict their beliefs. However, more research into engaging these individuals in other settings may be beneficial.

Limitations and Future Research Needs

The study had a few limitations, and while it provided some helpful insight into visitor attitudes, the results must still be examined with caution. It is important to keep in mind that although the findings seem to remain consistent with other studies, the study results may have been influenced by other factors. The survey methodology lacked a completely random sample and some research has shown that people who tend to fill out surveys also tend to have stronger opinions on issues such as climate change (Berk, 1983). In addition, the context of the informal science facility could have potentially played a role. It is possible that people answered in a way that they thought the facility would want them to respond. All three sites do encourage conservation behaviors in their exhibits and may contribute to a “social desirability bias” among participants (King & Bruner, 2000). Without further research, it is impossible to know if the same visitors would respond with as much concern outside the study sites.

The “Six Americas” national report was based on a sample of over 1,000 Americans. It was conducted utilizing a much larger survey that produced a greater degree of accuracy for the assessment of segment types. The distributions of segments among the visitor populations were examined using a shorter, less accurate version of the survey. Although the populations in this study sample are similar to that of the general visitor populations at these sites, there may have been some inaccuracies in segment distributions. In addition, all participants who filled out the survey were adults over the age of 18 and were only visitors to one of three facilities in Oregon. Therefore, the results should not be generalized to visitors under the age of 18 or at other facilities around the state or country.

One aspect of the study that may have influenced visitor response was the use of the terms “global warming” and “climate change” interchangeably. The reason for this was to remain consistent with the national study (who used the word “global warming”) to create an equal comparison. A few recent studies have shown that the terms themselves may evoke separate responses and opinions from participants (see Whitmarsh, 2009). Global warming tends to be geared more toward the human impacts, while climate change is often associated with natural causes and other impacts. For this reason, the term “global warming,” which was utilized in the questionnaire, may evoke stronger responses from participants on “climate change.” There is no way to know whether the more unconcerned visitors might have responded with less certainty if the survey had exchanged words.

Regardless of these limitations, several implications for future research arose from this study. The first involves continuing the study at Marine Discovery Tours, the ecotour operator that was initially involved in this project along with the other facilities. Unfortunately, due to the end of the tourist season, it was impossible to collect sufficient data to include in the overall visitor sample. However, this site would provide a good comparison of a different type of informal setting and the small amount of data that was collected shows some interesting trends. Out of the

28 surveys, the visitors were distributed evenly across the Alarmed (29%), Concerned (21%), Cautious (25%), and Doubtful (21%). There were no visitors who fell into the Dismissive and only one in the Disengaged. It would be interesting to see if this distribution held in a larger sample size and what that might imply for any educational programming at the site.

Although the implications for the sites were informed by this study, they are basic recommendations. This report covered only a small portion of how visitors think about and respond to the topic of climate change. Many more factors may influence what visitors take away from climate change messages. For instance, Falk et al, 2007 found that visitors come into facilities with an “entering motivation” that ultimately will play a large role in shaping that person’s experience. In addition to this, peoples’ responses to communication efforts may also be influenced by the social group with whom they are entering the facility. All of these characteristics along with the visitor’s climate change attitude will determine what the visitor pays attention to and what meaning they take away. Thus, any future research utilizing this segmentation analysis to measure attitude change would benefit from measuring some of these other aspects.

Finally, the tendency for beliefs and concerns to change and be shaped by world events should be taken into account when developing climate change communication in the future. Research efforts should continue to examine visitor perceptions over time. Current perceptions of climate change at the three sites are generally encouraging for educators such as the NWZAA who wish to inspire more informed decisions, but are also quite complex. No single method will be effective across all audiences. As the topic of climate change becomes a larger part of our everyday vocabulary and more people will need to make both political and personal decisions in the coming years, settings such as informal science facilities will play an increasingly important role. Thus, designing the best communication methods cannot succeed without the close

collaboration between scientists, social scientists, and educators to examine their visitors' underlying knowledge, concerns, and motivations.

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Appendix A

Survey Materials

Public Consent Document



Shawn Rowe
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Climate Change Visitor Survey

Dear Participant,

You are being invited to take part in a research project on visitor attitudes toward climate change. The purpose of this project is to compare visitor perceptions between different informal science learning sites in Oregon and provide basic data that will be used toward future development of exhibits and activities.

We are requesting information from people using a survey. This letter is to help answer any question you have about what we are doing and why. It will help you decide if you would like to complete the attached question sheet. You may ask any question about the survey, what you will be asked to do, the risks and benefits, your rights as a volunteer, and anything else about the survey or this letter that is not clear. To do so, contact Shawn Rowe at (541)-867-0190 or by email at shawn.rowe@oregonstate.edu. This process is called "informed consent". You may take this letter in case you have any questions later.

You may spend as much or as little time answering the questions on this survey as you would like. Participating is voluntary. **You may choose not to take part at all. You may stop participating at any time.** There are no risks and no specific benefits for you associated with this study. Your help is extremely valued because you will be helping us to create better experiences for future visitors.

We will NOT be taking your name for the purpose of this research. All data collected will be grouped together with that of other participants, so there is no way that your information can be linked to you. You will remain completely anonymous.

We are selecting adults **over the age of 18** and will ask a total of 400 visitors to complete this survey. Only the people carrying out this study will have access to this data. Generalized findings will be shared with staff at Marine Discovery Tours, Hatfield Marine Science Center, Oregon Coast Aquarium, and the Oregon Zoo. The findings will also be included in a research report. Participants will not be identified.

If you have any questions about our work, please contact: Shawn Rowe at 541-867-0190 or by email at shawn.rowe@oregonstate.edu. If you have questions about your rights as a participant, please contact Oregon State University Institutional Review Board (IRB) Human Protections Administrator, at (541) 737-3437 or by email at IRB@oregonstate.edu.

Your help and cooperation are appreciated. Thank you for helping us to create better learning environments!

Sincerely,

Joy Irby
Graduate Student Researcher
Oregon State University

Visitor Survey

Thank you for participating in this research survey! Please note there are no wrong answers and you can stop participating at any time.

Please check or circle your answer.

How do you feel about Climate Change?

You may have noticed that global warming has been getting some attention in the news. Global warming refers to the idea that the world's average temperature has been increasing over the past 150 years, may be increasing more in the future, and that the world's climate may change as a result.

1. What do you think? Do you think that global warming is happening?

- ☐ Yes
☐ No
☐ I don't know (*Go to question #3*)

2. How sure are you about your answer to Question #1?

- | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Not at all
sure | Somewhat
sure | Very
sure | Extremely
sure |

3. Assuming global warming is happening, do you think it is...

- ☐ Caused mostly by human activities
☐ Caused mostly by natural changes in the environment
☐ Other
☐ None of the above because global warming isn't happening

4. How worried are you about global warming?

- | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Not at all
worried | Not very
worried | Somewhat
worried | Very
worried |

5. How much do you think global warming will harm you personally?

- | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Not at all | Only a little | A moderate
amount | A great deal | Don't know |

Turn Page 

6. When do you think global warming will start to harm people in the United States?

- ☐ They are being harmed now
- ☐ In 10 years
- ☐ In 25 years
- ☐ In 50 years
- ☐ In 100 years
- ☐ Never

7. How much do you think global warming will harm future generations of people?

- ☐ Not at all
- ☐ Only a little
- ☐ A moderate amount
- ☐ A great deal
- ☐ Don't know

8. How much had you thought about global warming before today?

- ☐ Not at all
- ☐ A little
- ☐ Some
- ☐ A lot

9. How important is the issue of global warming to you personally?

- ☐ Not at all important
- ☐ Not too important
- ☐ Somewhat important
- ☐ Very important
- ☐ Extremely important

10. How much do you agree or disagree with the following statement: "I could easily change my mind about global warming."

- ☐ Strongly disagree
- ☐ Somewhat disagree
- ☐ Somewhat agree
- ☐ Strongly agree

11. How many of your friends share your views on global warming?

- ☐ None
- ☐ A few
- ☐ Some
- ☐ Most
- ☐ All

12. Which of the following statements comes closest to your view?

- ☐ Global warming isn't happening
- ☐ Humans *can't* reduce global warming, even if it is happening
- ☐ Humans *could* reduce global warming, but people aren't willing to change their behavior so we're not going to
- ☐ Humans *could* reduce global warming, but it's unclear at this point whether we will do what's needed
- ☐ Humans *can* reduce global warming, and we are going to do so successfully

13. Do you think citizens themselves should be doing more or less to address global warming?

- | | | | | |
|-----------------------|-----------------------|-------------------------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Much less | Less | Currently doing
the right amount | More | Much more |

14. Over the past 12 months, how many times have you punished companies that are opposing steps to reduce global warming by NOT buying their products?

- ☐ Never
- ☐ Once
- ☐ A few times (2-3)
- ☐ Several times (4-5)
- ☐ Many times (6+)
- ☐ Don't know

15. Do you think global warming should be a low, medium, high, or very high priority for the President and Congress?

- | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Low | Medium | High | Very high |

16. People disagree whether the United States should reduce greenhouse gas emissions on its own, or make reductions only if other countries do too. Which of the following comes closest to your own point of view?

The United States should reduce its greenhouse gas emissions...

- ☐ Regardless of what other countries do
- ☐ Only if other industrialized countries (such as England, Germany and Japan) reduce their emissions
- ☐ Only if other industrialized and developing countries (such as China, India and Brazil) reduce their emissions
- ☐ The US should not reduce its emissions
- ☐ Don't know

Turn Page ➡

Please provide us with some more information
Tell us a little about yourself!

Gender _____

Zip Code _____

Age: 18-25 26-35 36-55 56-74 75+

Your educational background: Some high school High school Technical
 Some college College Graduate work

How many times in the past 12 months have you visited the following:

Oregon Zoo _____

Oregon Coast Aquarium _____

Hatfield Marine Science Center _____

Marine Discovery Tours _____

Appendix B

Total Demographics of Sample and Segment Type

SEGMENTS	Total	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Dismissive
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Gender

Male (130)	43%	35%	43%	50%	57%	50%	61%
Female (170)	57%	65%	57%	50%	43%	50%	39%

Age

18-25 (24)	8%	7%	9%	6%	14%	9%	5%
26-35 (74)	25%	30%	23%	19%	29%	32%	11%
36-55 (131)	44%	38%	43%	52%	43%	41%	61%
56-74 (57)	19%	21%	21%	13%	14%	14%	22%
75 + (14)	5%	4%	4%	0%	0%	5%	0%

Education

HS or less (24)	8%	7%	3%	8%	57%	14%	17%
Technical (10)	3%	1%	3%	4%	0%	9%	11%
Some college (56)	19%	15%	21%	19%	0%	18%	33%
College (127)	42%	32%	48%	56%	43%	45%	28%
Grad work (83)	28%	45%	26%	13%	0%	14%	11%

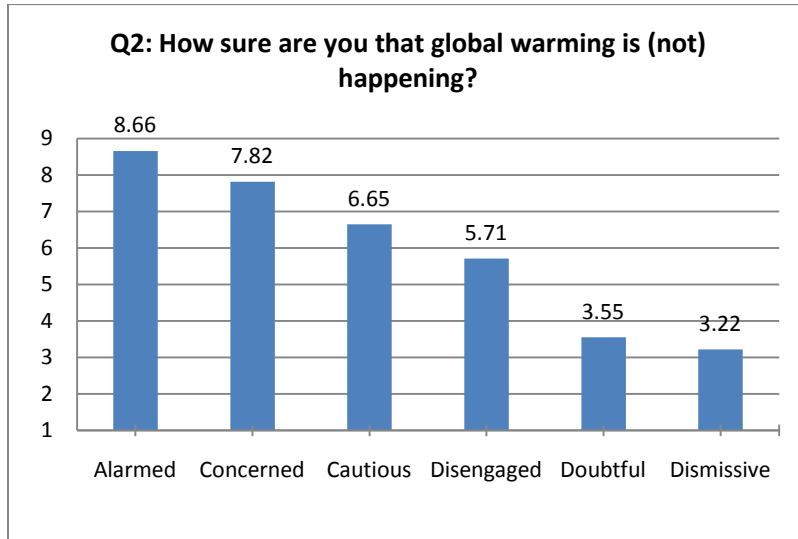
Frequent Visitor?

Yes (133)	44%	50%	46%	42%	29%	41%	22%
No (167)	56%	50%	54%	58%	71%	59%	78%

Appendix C

Individual Question Graphs

Mean Values for Each Answer by Segment Type

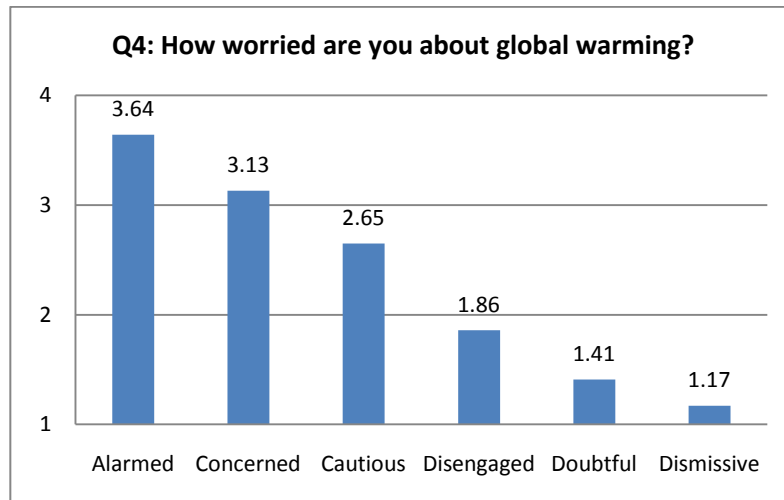


Avg. = 7.27

1 = “Extremely sure it’s not happening”

5 = “I don’t know”

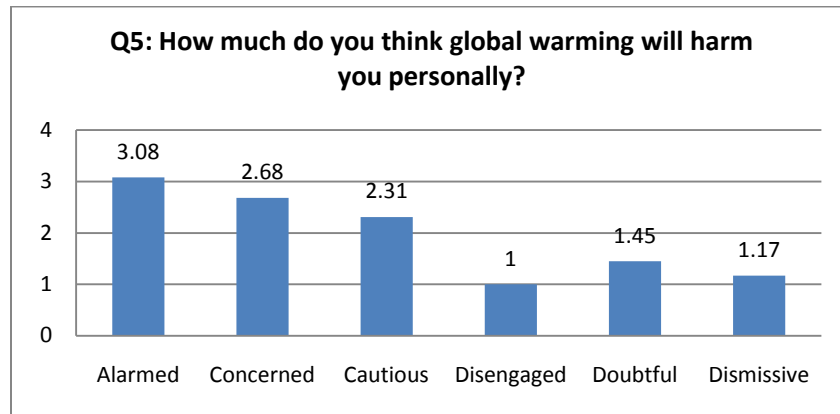
9 = “Extremely sure it is happening”



Avg. = 2.95

1 = “Not at all worried”

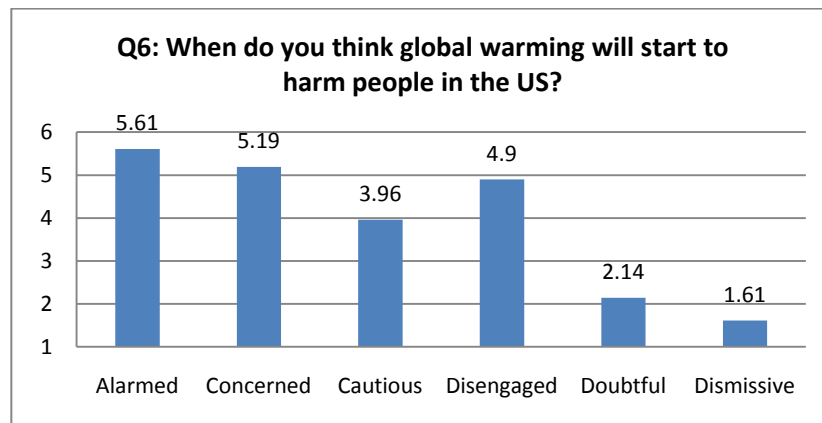
4 = “Very worried”



Avg. = 2.53

1 = "Not at all"

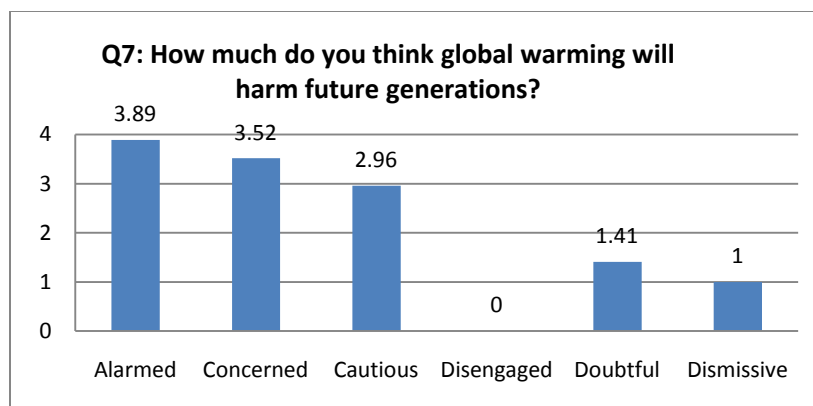
4 = "A great deal"



Avg. = 4.68

1 = "Never"

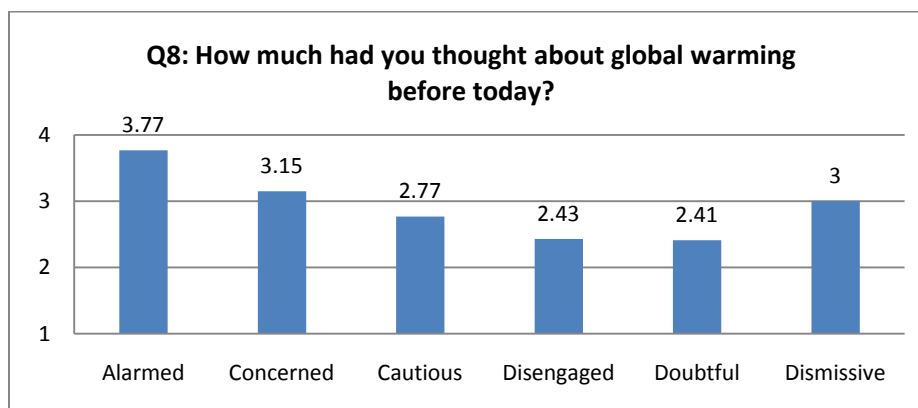
6 = "They are being harmed now"



Avg. = 3.16

1 = "Not at all"

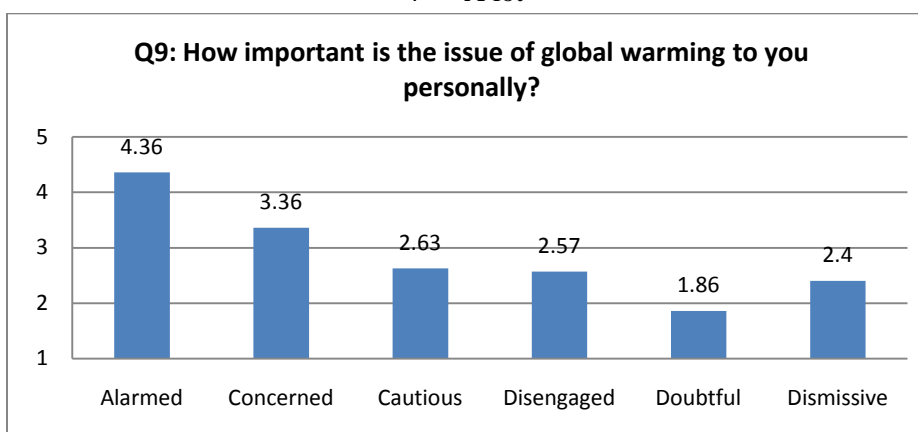
4 = "A great deal"



Avg. = 3.21

1 = "Not at all"

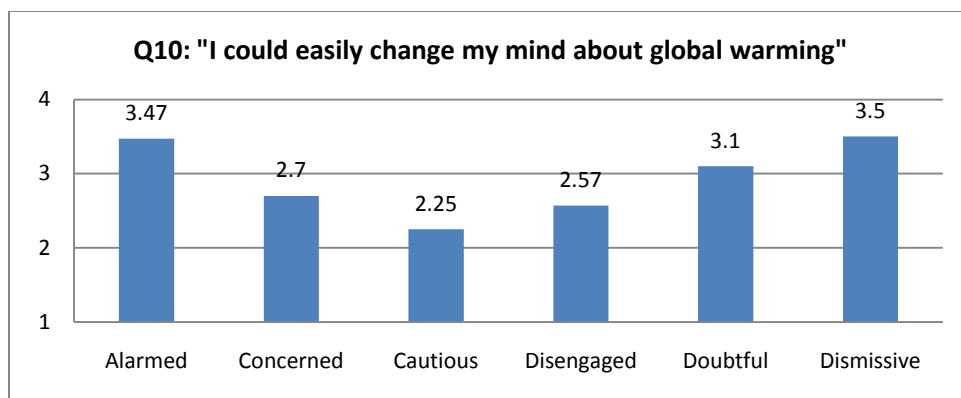
4 = "A lot"



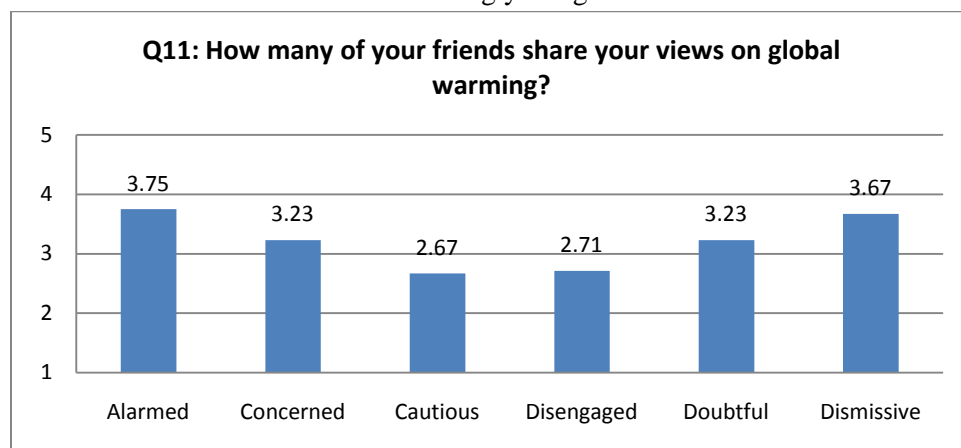
Avg. = 3.83

1 = "Not at all important"

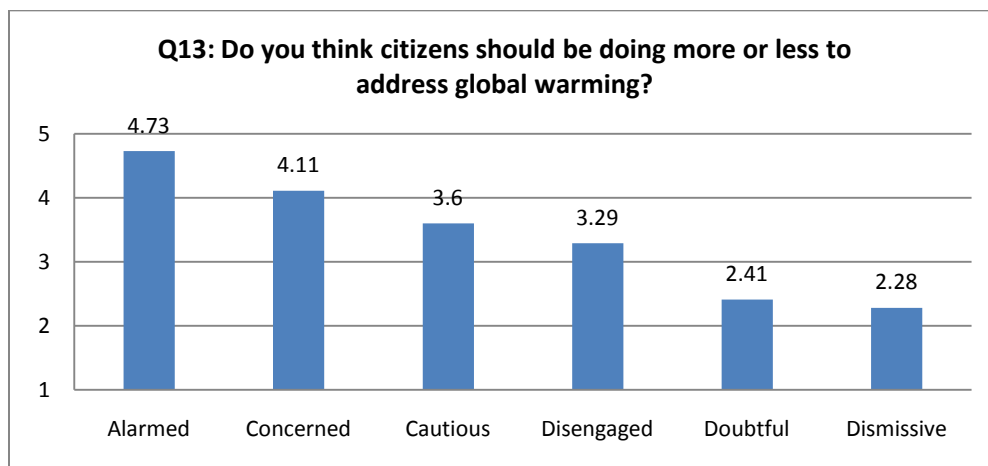
4 = "Extremely important"



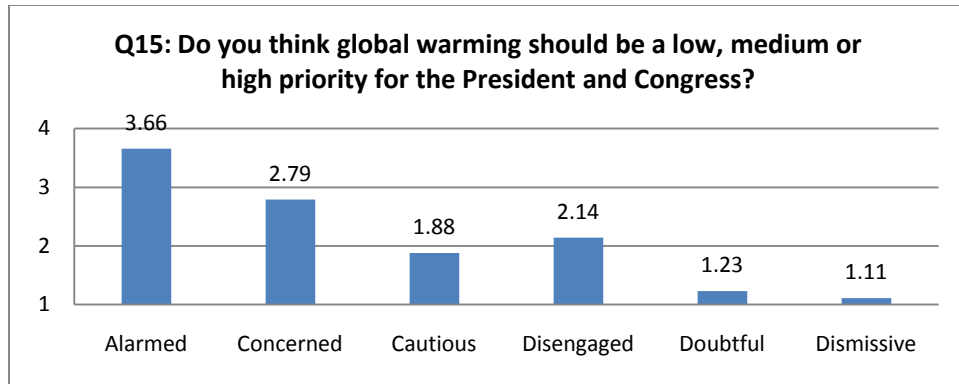
Avg. = 2.95
 1 = "Strongly agree"
 4 = "Strongly disagree"



Avg. = 3.32
 1 = "None"
 5 = All



Avg. = 3.98
 1 = "Much less"
 5 = "Much more"



Avg. = 2.70

1 = "Low"

4 = "High"

Q1: What do you think? Do you think global warming is happening?

	Average	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Dismissive
Yes	83	100	94	79	57	5	22
No	12	0	1	6	29	77	67
I don't know	6	0	5	15	14	9	9

Q3: Assuming global warming is happening, do you think it is caused mostly by...

	Average	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Dismissive
Human activities	55	82	63	27	0	9	11
Natural changes in the environment	21	2	11	52	57	68	33
Both equally (vol.)	19	16	26	21	43	5	0
Other	1	0	0	0	0	5	6
None of the above b/c global warming is not happening	4	0	0	0	0	14	50

Q12: Which of the following statements comes closest to your view?

	Average	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Dismissive
Humans can reduce global warming and we are going to do so successfully	4	8	1	4	0	0	0
Humans could reduce global warming, but it is unclear at this point whether we will do what's needed	58	74	70	46	43	5	0
Humans could reduce global warming, but aren't willing to change their behavior so not going to	22	17	25	31	29	18	6
Humans can't reduce global warming even if it's happening	11	0	4	19	29	45	44
Global warming isn't happening	5	0	0	0	0	32	50

Q14: Over the past 12 months, how many times have you punished companies that are opposing steps to reducing global warming by NOT buying their products?

	Average	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Dismissive
Many times (6+)	9	13	2	0	14	0	0
Several times (4-5)	14	12	11	4	14	0	0
A few times (2-3)	19	24	30	15	0	0	0
Once	3	28	3	4	0	0	0
Never	38	18	32	56	57	95	89
Don't know	17	4	22	21	14	5	11

Q16: The United States should reduce its greenhouse gases...

	Average	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Dismissive
Regardless of what other countries do	81	95	92	63	71	41	39
Only if other industrialized countries do	2	0	4	2	0	5	0
Only if other industrialized and developing countries do	5	1	2	19	0	14	6
The US should not reduce its emissions	5	1	0	2	14	18	39
Don't know	7	3	3	15	14	23	17