



CLIMATE CHANGE
IT'S IN YOUR BACK YARD

***Participating
Science Centers:***

Arizona Science Center;
Bishop Museum; Chabot
Space & Science Center;
EdVenture Children's
Museum; the Franklin
Institute; Maryland
Science Center;
Museum of Discovery &
Science; New Mexico
Museum of Natural
History and Science;
New York Hall of
Science; Reuben H.
Fleet Science Center;
Sciencenter; Saint Louis
Science Center.

***Partners and
Advisors:***

American Geophysical
Union; Cornell Labora-
tory of Ornithology,
Cornell University;
Natural History
Magazine; ScienCentral,
Inc.; University
Corporation for
Atmospheric Research,
Office of Education and
Outreach; Yale Project
on Climate Change,
Yale School of Forestry
and Environmental
Studies.

Communicating Climate Change

2009 Audience Research Results

Prepared for the Association of Science-
Technology Centers with Funding from the
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Prepared by Kasey McCracken

DAVID HEIL & ASSOCIATES, INC.

Innovations in Science Learning

4614 SW Kelly Avenue, Suite 100, Portland, Oregon 97239
(p) 503.245.2102 (f) 503.245.2628 www.davidheil.com

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Executive Summary

Communicating Climate Change (C3) is a National Science Foundation (NSF) funded project to foster innovative partnerships between research centers, the media, and science centers. The project, which is led by the Association of Science-Technology Centers (ASTC) and includes a collaboration of twelve science centers and their local research partners, is working to expand the role of science centers in educating the general public and inspiring changes in attitudes concerning climate change through programs, exhibits, and citizen science projects. Project partners include the American Geophysical Union, Cornell Laboratory of Ornithology, David Heil & Associates, Inc., Natural History magazine, University Corporation for Atmospheric Research, and the Yale Project on Climate Change.

David Heil & Associates, Inc. (DHA) is providing front-end, formative, and summative evaluation for the project. In the first year of the project, in addition to other evaluation activities undertaken to support project partners, DHA used both quantitative and qualitative methodologies to explore visitor attitudes towards climate change and interest in climate change-related programs and activities. This audience research included a Visitor Survey conducted across 11 of the 12 participating science centers and four focus groups designed to provide more in-depth exploration of the major themes from the survey. The results of these efforts are summarized in this report, which is intended to build upon what is already known about public knowledge and attitudes towards climate change and visitor interest in climate change exhibits and programs.

As a part of their participation in the C3 project, the Yale Project on Climate Change is working to further the understanding of the American public's knowledge of and attitudes towards climate change. The Yale Project on Climate Change brings expertise in American public opinion on climate change to the C3 collaboration, and the exploration of the visitor knowledge and attitudes towards climate change that DHA is undertaking for the C3 project is grounded in the work that they have conducted at the national level. This work not only provides useful national comparisons to facilitate interpretation of results from visitor samples, but also serves as an overall framework for guiding further investigation into how climate change programs and exhibits can be tailored to meet the needs of diverse audiences based on their knowledge and attitudes towards climate change.

In May 2009 the Yale Project on Climate Change, along with the George Mason University Center for Climate Change Communication, released "Global Warming's Six Americas 2009: An Audience Segmentation Analysis" (Leiserowitz et. al., 2009). The report uses data from a nationally representative survey (National Global Warming Survey) to identify and describe six groups of adult Americans who differ in their climate change beliefs, attitudes, risk perceptions, motivations, values, policy preferences, behaviors, and underlying barriers to action. The Six Americas Report calls on educators and communicators to utilize the profiles of each of these six groups to tailor messaging and educational activities to meet their unique needs.

Recent research into science center visitors' interest in science policy issues provides some insight into visitors' interests with regard to climate change. During 2008, Reach

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Advisors, in collaboration with ASTC, conducted a survey of core science center visitors¹ to determine their interest in science policy issues (Wilkening & Chung, 2009). In this survey, the science policy issue that was most frequently selected by respondents as the topic of greatest interest to them was “the environment and climate change,” with 79% of the 15,000 respondents selecting this topic.

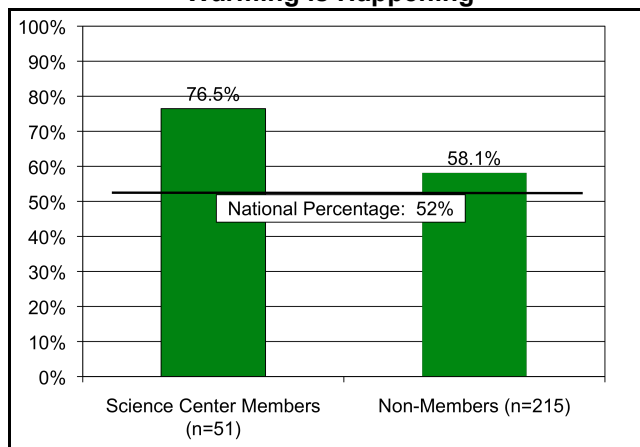
The on-going research into American public knowledge and attitudes toward climate change by the Yale Project on Climate Change, coupled with Reach Advisors’ exploration of visitors’ interest in science policy issues, provide a foundation for the research presented in this report. The following recommendations are based on the findings summarized in the full report, and are presented to provide guidance for both participating C3 science centers and other informal education organizations that are undertaking climate change-related educational efforts.

Recommendation 1: Leverage the science center visit as an opportunity to engage a broad range of visitors in climate change-related hands-on exhibits and activities.

The vast majority (approximately 80%) of respondents to the Visitor Survey did not visit the science center to seek out more information on climate change. Visitors come to science centers for a variety of reasons, and in this particular sample, the most frequently selected reason for the visit was “seeking a place to bring children” (54.2%, N=273). Most science center visitors appear to be looking for engaging and enriching experiences for their families and are not driven to the science center with a specific scientific question or content area in mind. As a result, the science center environment provides an opportune venue to provide climate change content to a diverse group of learners.

With this in mind, science centers should focus on designing climate change-related exhibits and hands-on activities (e.g. demonstration carts) that can engage a wide array of visitors in climate change topics. Although it is important to design exhibits to meet the needs of a specific target audience, a collection of exhibits or activities should provide multiple entry points to reach visitors who approach the learning experience with different knowledge and attitudes towards climate change. As shown in Figure 1, in comparison to the national sample, science center visitors tend to be more confident

Figure 1: Percentage of Respondents Reporting They are Very Sure or Extremely Sure Global Warming is Happening



Source (National Percentage): Leiserowitz et. al., 2009.
Note. Respondents rated their level of confidence on a 4-point scale from “Not at all Sure” (1) to “Extremely Sure” (4).

¹ Reach Advisors defines “core visitors” as those with whom science centers have some relationship, either as members or as subscribers to museum email lists.

that global warming is happening and more engaged in the issue, and yet even within the visitor group, there is variation in knowledge and attitudes that should be considered in the design of exhibits and activities.

An important area to consider in the design process is the selection of appropriate climate change-related topics. As shown in Figure 2, the results of the Visitor Survey suggest that there are some climate change-related topics that are of interest to visitors who differ considerably in their beliefs about climate change. These include: the impact of climate change on human health, current evidence for climate change (locally and globally), and the impact of climate change on the visitor’s region. In

Figure 2: Climate Change Topics of Interest

“Very” or “Extremely” Sure Global Warming is Happening (n=157)	“Somewhat” or “Not at all” Sure Global Warming is Happening (n=93)
The impact of climate change on human health (43.3%)	How scientists study climate change (46.8%)
The impact of climate change on biodiversity (32.1%)	Current evidence for climate change (locally & globally) (32.6%)
Current evidence for climate change (locally & globally) (29.3%)	The impact of climate change on human health (30.9%)
The impact of climate change on your region (28.7%)	The science of climatology (28.7%)
The science of climatology (27.8%)	The impact of climate change on your region (24.7%)
How scientists study climate change (25.9%)	The impact of climate change on biodiversity (20.2%)
The impact of climate change on urban areas (17.8%)	The impact of climate change on urban areas (9.7%)

Note. Percentage shown in parentheses is the percentage of respondents who ranked the topic 1st or 2nd out of the seven topics.

other cases, visitor interest in topics varies based on their underlying knowledge and attitudes. For example, visitors who express less confidence in the fact that global warming is occurring are far more interested in topics that showcase how scientists study climate change. Likewise, focus group members who tended to be more confident that global warming is occurring expressed a desire to see topics that showcase individual efforts to reduce global warming. Science centers should work to engage a wider array of visitors in climate change science by developing exhibits to address these varied interests in climate change.

Recommendation 2: Develop programs to fit the unique climate change interests of distinct public audience groups.

While visitor experiences on the science center floor must be designed to meet the needs of a diverse group of visitors, climate change-related programs should be targeted to meet the needs of distinct audience groups. Findings from the focus groups suggest that public audiences vary in the types of activities in which they are interested based on their underlying knowledge and attitudes towards climate change:

Science centers should go outside of what they’re doing, to go out into the public more. There needs to be another outlet.

– Adult Focus Group Participant

The idea of partnership with schools [is one of my favorite ideas]. You’re going to reach out to everyone in the schools.

– Adult Focus Group Participant

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Community meetings around the issue of climate change are likely to draw only those audiences that are already interested and engaged in the topic, while partnerships designed to provide programs and activities through K-12 schools (e.g. in afterschool settings, through open houses, etc.) provide an avenue for reaching a broader audience.

Science centers do not need to take a single programmatic approach at the exclusion of other approaches, but should ensure that they map the content and program type to the audience of interest. For example, family science nights that feature hands-on climate change activities, could be used to reach a broad audience in coordination with K-12 schools. In this case, the hands-on activities should include content to engage the diverse range of knowledge and attitudes that is likely to be represented by the attendees at these events. Likewise, because lectures and community climate change meetings are likely to draw audiences who are already engaged in the issue of climate change, these events should focus specifically on topics that appeal to these groups, such as current research on how to reduce global warming and how to mitigate the effects of climate change.

Of special consideration are findings from both the Visitor Survey and the focus groups that suggest that in order to effectively reach groups who are not confident that global warming is occurring, science centers must go to these audiences rather than assume that the audiences will come to them. To do so, science centers should explore integrating climate change-related activities into on-going outreach programs that they host with populations who are not engaged science center visitors. They should also seek innovative partnerships with community organizations that provide potential avenues for this type of service delivery.

Recommendation 3: Focus on presenting the science behind climate change-related topics, relying on and citing credible scientific sources.

The focus group findings presented in this report provide further support to the contention that visitors are looking to science centers to present science policy issues in an unbiased fashion (Wilkening & Chung, 2009). An important finding from the focus groups is that visitors' desire for unbiased information does not imply that they are looking to science centers to provide "opposing" perspectives of the issue. In fact, public audiences are sometimes confused by the presentation of multiple perspectives of climate change. Instead, they would like to see science centers focus on presenting current scientific findings related to climate change topics and allow visitors to draw their own conclusions about what the science should mean in terms of policy decisions and individual behavior.

This focus on the science of climate changes requires science centers to present only information that has been reported by credible scientific sources.

I have to see it for myself, in facts and figures. I'd have to hear from several sources, credible sources. – Parent Focus Group Member

Although, at face value, this would seem to be an easy task, focus group findings suggest that visitors are likely to vary in their views with regard to which sources are credible. For example, while some visitors will see government agencies, such as the National Oceanic and Atmospheric Administration (NOAA), as trusted sources of

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information, others may view these agencies as subject to political influences. Program and exhibit developers will need to make careful choices in the selection of research on which to base climate change-related content. One option for addressing concerns about the credibility of information is to ensure that exhibits and programs include information on the methods used to support the scientific findings.

Clearly, as found in the Reach Advisors study, science center visitors are interested in the issue of climate change, and by and large, they would like to see science centers address this issue through programs and exhibits. As science centers move forward in their efforts to educate the public about climate change they must do so with careful attention to the distinct needs of different audience groups. This report has taken steps towards specifying the type of exhibits and programs that are likely to best meet visitors' interests and needs based on their current knowledge and attitudes. Future audience research for the Communicating Climate Change project will focus on providing a more detailed exploration of these distinctions and a better understanding of the impact of climate change exhibits and programs for visitor audiences.

Introduction

Communicating Climate Change (C3) is a National Science Foundation (NSF) funded project to foster innovative partnerships between research centers, the media, and science centers. The project, which is led by the Association of Science-Technology Centers (ASTC) and includes a collaboration of twelve science centers and their local research partners, is working to expand the role of science centers in educating the general public and inspiring changes in attitudes concerning climate change through programs, exhibits, and citizen science projects. Project partners include the American Geophysical Union, Cornell Laboratory of Ornithology, David Heil & Associates, Inc., Natural History magazine, University Corporation for Atmospheric Research, and the Yale Project on Climate Change.

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Background Information

The Committee on Learning Science in Informal Environments recently published a report summarizing their review of science learning in informal environments and providing an agenda for research and development in the field (NRC, 2009). An important conclusion from their work was that understanding learners' prior knowledge, interest, and identity are especially important in the informal environment. Committee members emphasized the necessity of designing informal learning experiences with attention to these attributes. With this in mind, it is essential to understand the knowledge and attitudes about climate change that visitors bring with them to any experience related to the topic. The work presented in this report is intended to further the understanding of visitor knowledge and attitudes and is built on prior work related to American public knowledge and attitudes towards climate change and research into visitor interest in science policy issues.

Public Attitudes Towards Climate Change. As a part of their participation in the C3 project, the Yale Project on Climate Change is working to further the understanding of the American public's knowledge of and attitudes towards climate change. The Yale Project on Climate Change brings expertise in American public opinion on climate change to the C3 collaboration, and the exploration of the visitor knowledge and attitudes towards climate change that DHA is undertaking for the C3 project is grounded

in the work that they have conducted at the national level. This work not only provides useful national comparisons to facilitate interpretation of results from visitor samples, but also serves as an overall framework for guiding further investigation into how climate change programs and exhibits can be tailored to meet the needs of diverse audiences based on their knowledge and attitudes towards climate change.

In May 2009 the Yale Project on Climate Change, along with the George Mason University Center for Climate Change Communication, released “Global Warming’s Six Americas 2009: An Audience Segmentation Analysis” (Leiserowitz et. al., 2009). The report uses data from a nationally representative survey (National Global Warming Survey) to identify and describe six groups of adult Americans who differ in their climate change beliefs, attitudes, risk perceptions, motivations, values, policy preferences, behaviors, and underlying barriers to action. Figure 1 provides descriptions of each group in terms of their beliefs and issue involvement from the report, along with estimates of their proportional representation within the US population. The Six Americas Report calls on educators and communicators to utilize the profiles of each of these six groups to tailor messaging and educational activities to meet their unique needs.

Figure 1a: Beliefs and Issue Involvement for the 6 Americas

The Alarmed (18%) are the segment most convinced that global warming is happening. Global warming is very important to them and they are very worried about it. They have thought a lot about the issue, believe 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.

The Concerned (33%) are convinced that global warming is happening, although they are less certain than the Alarmed. The issue is also less important to them than to the Alarmed, yet they are relatively worried about it. The Concerned have thought some about global warming, believe they are somewhat informed about the causes, consequences, and potential solutions, and are somewhat 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.

The Cautious (19%) are somewhat convinced that global warming is happening, but this belief is relatively weak, with many saying they could change their minds. The Cautious have only thought a little about global warming, do not consider it personally important, and tend not to worry about it. They are only somewhat informed about the causes, consequences, and potential solutions. About half believe that human activities are the primary cause, and well over a third believe there is a lot of disagreement among scientists over whether global warming is happening.

(Continued in Figure 1b)

Adapted from Leiserowitz, A., Maibach, E., and Roser-Renouf, C. (2009), pages 5-6.

Figure 1b: Beliefs and Issue Involvement for the 6 Americas

(Continued from Figure 1a)

The Doubtful (11%) say they don't know whether global warming is happening. They also say the issue is not personally important to them and they are not worried about it. The Doubtful have thought only a little about global warming, say they are informed only a little about the causes, consequences, and potential solutions, 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.

The Dismissive (7%) are sure that global warming is not happening. They say the issue is not at all important to them personally and are not worried about it at all. The Dismissive, however, say 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 of the Dismissive believe there is a scientific consensus that global warming is not happening.

Visitor Interest in Science Policy Issues. Recent research into science center visitors' interest in science policy issues provides some insight into visitors' interests with regard to climate change. During 2008, Reach Advisors, in collaboration with ASTC, conducted a survey of core science center visitors² to determine their interest in science policy issues (Wilkening & Chung, 2009). In this survey, the science policy issue that was most frequently selected by respondents as the topic of greatest interest to them was "the environment and climate change," with 79% of the 15,000 respondents selecting this topic.

The Reach Advisors analysis explored differences in interest in climate change and the environment between demographic groups. For example, they found that men over age 60 were slightly less likely to select "the environment and climate change" as the science policy issue of most interest to them. The survey further explored respondents' underlying reasons for their interest in the policy issues through an open-ended item, and researchers found that a central theme to these responses was "the idea of the science museum as a source of unbiased information." They also noted that for those respondents who selected "the environment and climate change," the open-ended topics tended to be more emotive than for those who selected an alternative topic, suggesting that the topic of climate change is more emotional for audiences than alternative topics such as biotechnology and its medical applications, genetic engineering (including genetically modified food), nanotechnology, and stem cell research and human cloning.

The on-going research into American public knowledge and attitudes toward climate change by the Yale Project on Climate Change, coupled with Reach Advisors'

² Reach Advisors defines "core visitors" as those with whom science centers have some relationship, either as members or as subscribers to museum email lists.

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exploration of visitors' interest in science policy issues, provide a foundation for more a more direct examination of science center visitor interest in climate change programs and exhibits. The work summarized in this report is intended to extend these prior research efforts by addressing the questions:

1. How do science center visitors' knowledge and attitudes towards climate change compare to those of a national sample of Americans; and how do visitor groups differ in terms of their knowledge and attitudes?
2. Does visitor exposure to climate change programs and exhibits result in an increase in interest in the issue of climate change?
3. What are the major sources of climate change information for visitors?
4. What types of climate change programs and activities are of interest to visitors; and how does visitor interest in these programs and activities differ based on their knowledge and attitudes towards climate change?

This report uses the results of a visitor survey and public focus groups to address these questions and presents recommendations to guide science centers' efforts to communicate climate change concepts to public audiences based on those findings. It is important to note that while this report begins to address Question 2, by looking at visitor reports of climate change-related follow-up activities undertaken after a visit to a science center, it is not intended as a summative evaluation report of the C3 project. Instead, it should serve as audience research to support program and exhibit planning for climate change. The following section describes the Visitor Survey and focus group methodologies and is followed by a summary of the results and a presentation of the recommendations.

Methodology

During Year One of the C3 project, DHA conducted a Climate Change Visitor Survey (Visitor Survey) to gather data related to visitors' knowledge and attitudes towards climate change and conducted a series of four public audience focus groups to further explore these quantitative findings. The data collection protocols for the Visitor Survey and the focus groups are described below.

Visitor Survey

DHA conducted the Visitor Survey during Spring and Summer 2009. The online survey was conducted with visitors to 11 science centers from May through August. The purpose of the Visitor Survey was to assess science center visitors' exposure to climate change educational activities, understanding of climate change, attitudes towards climate change, and interest in participating in climate change events and activities. The survey items related to visitors' understanding and attitudes towards climate change were adopted from items used by the Yale Project on Climate Change in national survey samples to facilitate comparison of results for science center visitors' to those for national samples.

Each science center identified a 5-day period to collect visitor emails by placing email data collection forms in a high-traffic area of the science centers along with a data collection box. The data collection forms requested that visitors provide their email address to participate in an online survey within a month of their visit to the science center. Visitors were offered a chance to win one of 5 prizes valued at \$150. The online survey was distributed via email within approximately one month of the email data collection period.

The online survey was conducted in three waves to coordinate the on-site collection of visitor emails with the survey distribution. During each wave the online survey remained open for two weeks. In addition to the original distribution email, two reminder emails were distributed during this two-week window. Figure 2 below lists the science centers that participated in each wave of the survey. The mean number of days from the time the visitor's email was collected to the time that the visitor completed the survey was 41 days (Min=7, Max=108, SD=16.9, N=294). The following section provides a description of the sample of visitors who were included in the survey.

Figure 2: Science Centers Participating in Each Survey Wave

Wave 1 May 14 th - June 18 th	Wave 2 June 5 th - June 26 th	Wave 3 August 14 th - September 4 th
1. Museum of Discovery and Science 2. Sciencenter 3. Maryland Science Center 4. Edventure (Batch 1)	4. Edventure (Batch 2) 5. Reuben H. Fleet Science Center 6. The New York Hall of Science	7. Chabot Science Center 8. Bishop Museum 9. St. Louis Science Center 10. The Franklin Institute 11. New Mexico Museum of Natural History

Sample Description

A total of 294 C3 science center visitors completed the online follow-up Visitor Survey. This sample included respondents from each of the eleven participating science centers. The following sections provide descriptions of the science centers represented in the sample and describe demographic characteristics of the visitor respondents.

Science Center Representation. Table 1 below summarizes the results of the data collection process for each science center. The overall response rate for the survey was 22.4%, but the response rate varied considerably across the participating science centers. Visitors to four of the science centers (Maryland Science Center, St. Louis Science Center, Reuben H. Fleet Science Center, and the New York Hall of Science) constituted approximately two-thirds of the overall sample. The seven science centers in the remaining third of the sample each contributed less than 10% of the visitors in the overall sample.

**Table 1: Data Collection Results by Science Center
Ordered by Percentage Representation in the Sample**

Science Center	Valid Emails Collected	Survey Response Rate	Percentage of Overall Sample
Overall	1314	22.4%	100%
Maryland Science Center	270	25.9%	23.8%
St. Louis Science Center	258	20.5%	18.0%
Reuben H. Fleet Science Center	161	24.2%	13.3%
New York Hall of Science	202	17.8%	12.2%
Edventure	101	24.8%	8.5%
Bishop Museum	82	23.2%	6.5%
Chabot Science Center	51	33.3%	5.8%
Sciencenter	33	51.5%	5.8%
Museum of Discovery & Science	78	10.3%	2.7%
The Franklin Institute	28	25.0%	2.4%
New Mexico Museum of Natural History & Science	50	6.0%	1.00%

The participating C3 science centers vary considerably in terms of their size, location, and, in some cases, the focus of their programs and exhibits. The 2008 on-site attendance across the science centers ranged from 91,895 for Sciencenter to 1,755,558 for the Franklin Institute (ASTC, 2009). Based on the relative contributions of the science centers to the overall sample, in terms of square footage, 11.6% of respondents visited a small science center; 31.0% visited a medium-sized science center; and 57.5% visited a large science center (N=294)³. Examples of variations in the focus of programs and exhibits include: Edventure is a children’s museum; Chabot Science Center features exhibits and programs related to earth and space sciences; and the New Mexico Museum of Natural History features exhibits and programs related to the natural history and physical sciences of New Mexico and the Southwest. In addition, based on

³ Based on 2008 ASTC Sourcebook of Statistics & Analysis categories: Very small is < 12,000 sqft; Small is 12-25,000 sqft; Medium is 25-50,000 sqft; and Large is > 50,000 sqft.

location, some of the science centers, such as The Franklin Institute, are more likely to draw out-of-town visitors than are others.

Visitor Representation. The majority of respondents (65.2%) to the survey were female (N=256). As shown in Figure 3, over half (58.8%) of respondents were between the ages of 25 and 44. Eight point five percent (8.5%) of respondents identified themselves as Hispanic. Respondents identified their race as Caucasian (76.1%), Asian or Asian American (12.0%), African American (3.5%), Native American (1.4%), and other (7.0%).⁴ As shown in Figure 4, the survey respondents reported high levels of education, with approximately 84% of respondents reporting that they had completed at least some college coursework.

Figure 3: Age (N=257)

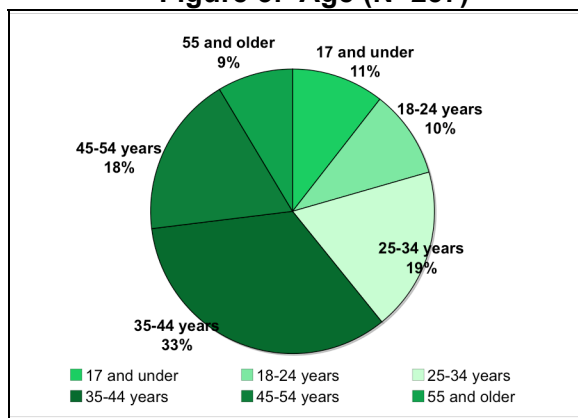
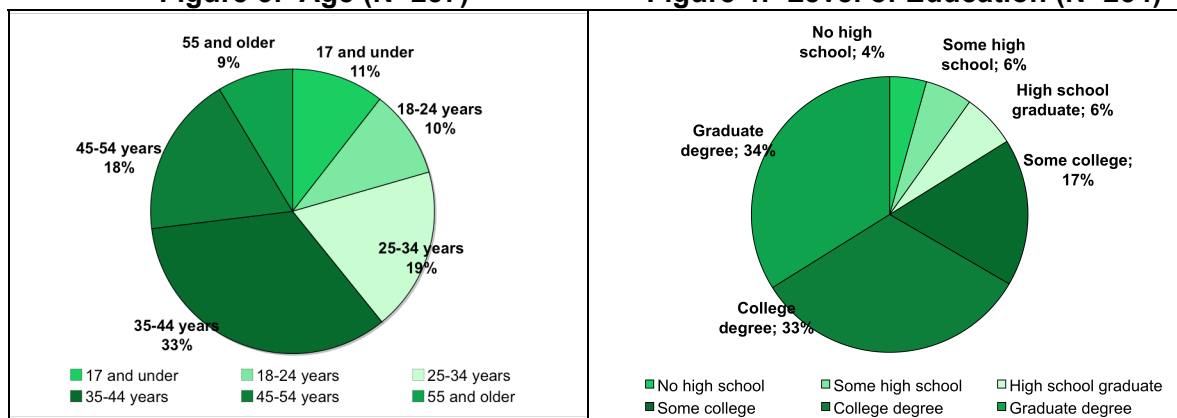


Figure 4: Level of Education (N=254)



Visitors to the science centers were asked to provide some descriptive information about their visitor group at the time that they submitted their email address for the follow-up survey. Fifty-four percent (54%) of respondents reported that the group included an adult visitor⁵ (N=294). For these respondents (n=159), the majority reported that their group included one male and one female adult (57.2%). Eighty-two point nine percent (82.9%) of respondents reported that their group included at least one child, and the mean number of children in the group was 2.35 (SD=1.46, Min=1, Max=9, n=244). For these respondents, the age of children in the group ranged from 1 year to 17 years. The mean age of the youngest child in the group was 6.72 (SD=4.04, n=244), and the mean age of the oldest child in the group was 9.75 (SD=4.04, n=244).

Visitors reported their membership status and history of visiting the science center on the Visitor Survey (N = 277). This information was used to develop the following three categories, which describe the visitor's affiliation with the science center:

- **Members (19.5%).** Respondents who identified themselves as members of the science center at the time of their visit.

⁴ Respondents could select multiple response options.

⁵ It is not possible to determine whether these visitors simply left the item blank, or whether an adult was not present at the time that the form was completed.

- **Non-member visitors (37.5%).** Respondents who identified themselves as non-members at the time of their visit, but who had visited the science center within the past year.
- **Non-member non-visitors (43.0%).** Respondents who identified themselves as non-members at the time of their visit, and who had not visited the science center within the past year.

Public Audience Focus Groups

To further explore the quantitative findings from the Visitor Surveys, DHA conducted a total of four focus groups with potential audience groups for two of the participating science centers. Two general public focus groups were conducted with potential audiences of the New York Hall of Science, and two focus groups were conducted with potential audiences for Sciencenter. The two sets of focus groups employed different recruitment strategies: The groups for the New York Hall of Science utilized a focus group recruiting firm to provide a general public recruit for specific demographic characteristics and level of interest and engagement in science centers and climate change; the Ithaca groups were recruited by Sciencenter staff and included youth in an on-going Sciencenter program and a broad age range of adults who were recruited for their interest in climate change. These different recruitment strategies resulted in important differences in characteristics related to climate change beliefs and attitudes for the Ithaca and New York City groups, suggesting that the comments that they provided within the context of the focus groups are reflective of the perspectives of different segments of the population. Basic demographic characteristics and information about beliefs and attitudes towards climate change are summarized below.

Sample Description

To better understand the perspectives represented in the focus groups, focus group participants were asked to rate their confidence that global warming is happening and how important the issue is to them personally on a scale from one to ten. Participants' responses to these items provide insight into the perspectives that were represented in each of the four focus group discussions. Results from these items are summarized below, along with basic demographic information for the youth and adult focus groups.

Youth Focus Group Participants. The New York City Focus Group included four females and four males, ages 11 to 14 years, and the Ithaca Focus Group included four females and four males, ages 15 to 18. The majority of participants in both groups identified themselves as Caucasian; two members of the New York City group identified themselves as Hispanic and one member of the Ithaca group identified himself as Asian/Pacific Islander. All of the members of the New York City group reported visiting at least two cultural destinations within the past year (i.e. a zoo, aquarium, nature center, natural history museum, or science center), and five of them reported visiting a science center within the past year. Most of the members of the Ithaca group were involved in the Scienceworks youth program at Sciencenter; and a number of them reported being members or visiting frequently when they were younger.

As shown in Figure 5, across both focus groups participants reported high levels of confidence that *global warming is happening*. For the Ithaca group, over half of the

participants rated their confidence as a ten and no one rated it below an eight. For the New York City groups, the range in responses was greater, with a minimum rating of four for the youth group. Likewise, as shown in Figure 6, while the lowest rating for the importance of the issue of global warming was a 6 for the Ithaca group, it was a 0 for the New York City group. These differences between the groups are likely reflective of the different recruitment efforts for these focus groups (a general public recruit for the New York City group, and a recruit based primarily on program involvement for the Ithaca group).

Figure 5: Youth Focus Group – How sure are you that global warming is happening?

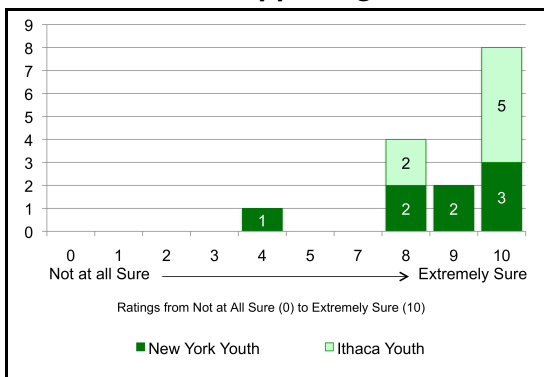
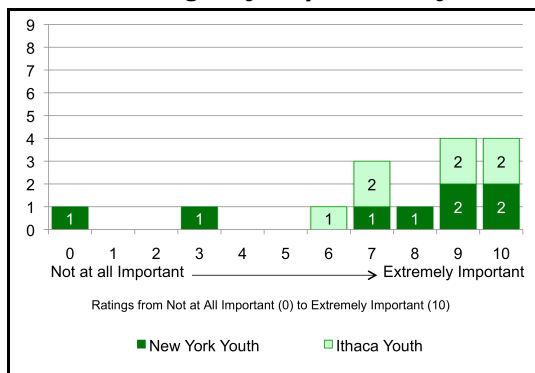


Figure 6: Youth Focus Group – How important is the issue of global warming to you personally?



Adult Focus Group Participants. The New York City Focus Group included five females and three males, with ages in the ranges of 25-34 (1 participant), 35-39 (2 participants), 40-45 (2 participants), and 46-54 (3 participants). Six of these participants reported themselves to be Caucasian, one reported herself as Hispanic, and one reported himself as African American. All of the participants in the New York City group were parents of children between the ages of 8 and 13 (some also had younger and older children). All of the members of the New York City group reported visiting at least two cultural destinations within the past year (i.e. a zoo, aquarium, nature center, natural history museum, or science center). Five of them had visited a science center within the past year, and the remainder had visited a science center within the past five years.

The Ithaca Focus Group included seven females and four males, with ages in the ranges of 20-29 (5 participants), 30-39 (2 participants), 40-49 (1 participant), and 50 or greater (2 participants). All of them reported themselves to be Caucasian. Only four members of this group were parents of children under 18 (the ages of the children ranged from 5 to 17). Two of these participants were current members of Sciencenter, one was a former member, and the remainder had never been members of Sciencenter.

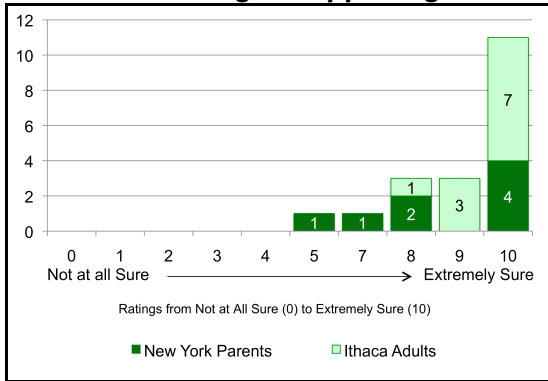
As shown in Figures 7 and 8, participants’ ratings of how sure they are that global warming is happening was greater for the New York City group than for the Ithaca group, while the range of responses for how important the issue is was the same for both groups, with all of the adult participants rating the importance as at least an 8 on the 10-point scale. The difference between groups with regard to their confidence that global warming is happening is probably reflective of the different recruitment strategies for the group. Once again, the New York City group reflects a more general public recruit, while

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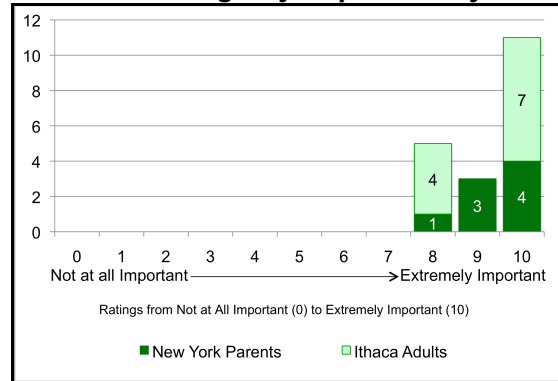
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the Ithaca group was more likely to already have some interest in the issue of global warming.

**Figure 7: Adult Focus Group –
How sure are you that global
warming is happening?**



**Figure 8: Adult Focus Group –
How is the important issue of global
warming to you personally?**



Results

This section summarizes findings from the Visitor Survey and the youth and adult focus groups with regard to visitor knowledge and attitudes towards climate change, the impact of current climate change programs and activities for participating visitors, current climate change information sources, and visitor interest in climate change programs and activities. The Appendix of this report displays the item-level results for the 2009 Visitor Survey. For items that were adopted from National Global Warming Survey results for the national sample are displayed alongside the results from Visitor Survey sample. This section summarizes the results from follow-up analyses conducted for the Visitor Survey, including comparisons for groups based on the respondents' affiliation with the science center and whether or not they participated in climate-change related activities at the science center.

Themes from the focus groups are summarized to provide further depth to the survey findings. In reviewing the focus group findings, it is important to bear in mind the differing recruitment strategies employed for the New York City and Ithaca groups. Although both groups included members with varying levels of interest and engagement in the issue of climate change, across the groups, the youth and adult New York City groups included the individuals with the lowest ratings for confidence that global warming is happening and for the importance of the issue to them personally (see description of the Public Audience Focus Groups in the Methodology section). Thus, in terms of information needs and program interests, the Ithaca Focus Groups appear to represent the perspectives of a group that is already interested and engaged with the issue of climate change, while the New York City Focus Groups represent a less interested and engaged group.

Visitor Knowledge & Attitudes Towards Climate Change

Both the Visitor Survey and the focus groups provide information on visitors' knowledge and attitudes towards climate change. The Visitor Survey included items from the National Global Warming Survey that ask respondents to indicate how sure they are that global warming is happening, what they think scientists believe about climate change, whether they believe that climate change is caused by human activities, and how concerned they are about climate change. The focus groups probed these areas in greater depth by further exploring the underlying reasons for these attitudes and beliefs. Findings from both the Visitor Survey and focus groups are summarized separately below.

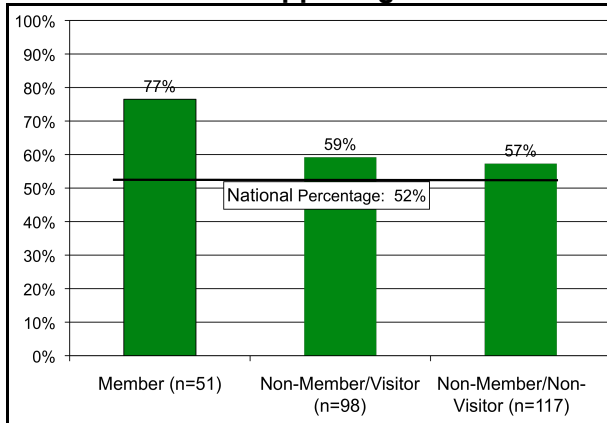
Visitor Survey Findings

To better understand the association between knowledge and attitudes towards climate change and a respondent's affiliation with the science center, an analysis was conducted

to compare visitors based on whether they were a member (n=54), a non-member/visitor (n=104), or a non-member/non-visitor (n=119).⁶

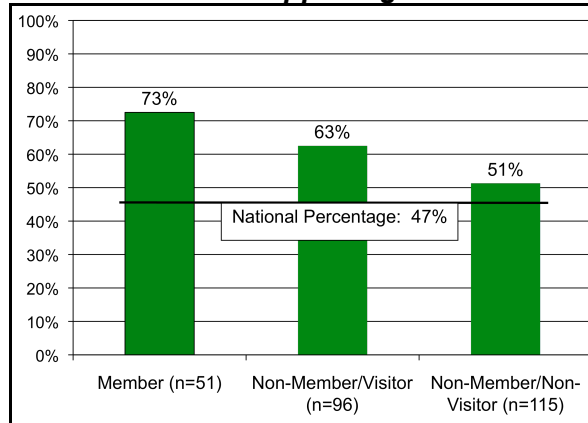
As shown in Figures 9 and 10, there were differences between the three visitor groups (Members, Non-member/Visitors, and Non-member/Non-visitors) with regard to how confident they were that global warming is happening and their beliefs about the opinions of scientists with regard to global warming. Science center members were more likely to report that they are *very sure* or *extremely sure* that climate changes is happening than were Non-Member/Visitors or Non-Member/Non-Visitors⁷. Members were also more likely than Non-members to report that they believe that *most scientists think global warming is happening*, and Non-Member/Visitors were more likely to report this belief than were Non-Member/Non-Visitors.

Figure 9: Percentage of Respondents who said they are very sure or extremely sure global warming is happening



Source (National Percentage): Leiserowitz et. al., 2009. Note. Respondents rated their level of confidence on a 4-point scale from “Not at all Sure” (1) to “Extremely Sure” (4).

Figure 10: Percentage of Respondents who said that they believe that most scientists think global warming is happening



Source (National Percentage): Leiserowitz et. al., 2009. Note. Respondents chose from “most scientists think global warming is happening,” “most scientists think global warming is not happening,” and “there is a lot of disagreement among scientists.”

Across the items related to knowledge and attitudes towards climate change no statistically significant differences⁸ between groups were found with regard to beliefs in the cause of global warming; how well informed the respondent felt regarding the causes, consequences, and ways to reduce global warming; how worried the respondent was about global warming, how much they believed global warming would cause harm, how much they had thought about global warming, and how important the issue of global warming was to them personally. Overall, members of the Visitor Survey

⁶ These categories are based on whether the visitor identified her/himself as a member of the science center and/or whether she/he had visited the science center within the past year at the time of the visit at which he/she provided an email address for the Visitor Survey (a description of the categories is provided in the *Methodology* section)

⁷ Significance is based on a p-value less than or equal to 0.05 under a Chi-square analysis, (2, N=266) = 13.46, p=.051.

⁸ Based on Chi-Square analyses, using alpha <= .05.

sample were more likely than members of the National sample to report that they global warming is caused by human activities, that they are worried about global warming, that that had thought about global warming before completing the survey, and that global warming is important to them personally. The results for these comparisons are summarized below (and shown in more detail in the tables and figures in the Appendix).

- The percentage of Visitor Survey respondents who reported that they believe that global warming is *caused mostly by human activities* (66.0%) was higher than the percentage for the national sample (57.0%).
- The percentage of Visitor Survey respondents who reported that they are *very worried* or *somewhat worried* about global warming (74.0%) was higher than the percentage for the national sample (63.0%).
- The percentage of Visitor Survey respondents who reported that they had thought about global warming *a lot* or *some* (71.8%) was higher than the percentage for the national sample (55.0%).
- The percentage of Visitor Survey respondents who reported that global warming is *very important* or *extremely important* to them personally (46.5%) was higher than the percentage for the national sample (32.0%).

Focus Group Findings

The focus groups provided additional information about public knowledge and attitudes towards climate change. In spite of the high ratings that youth provided for their confidence that global warming is happening, some members of both the New York City and Ithaca Focus Groups expressed doubts that the phenomena is occurring or that it is the result of human behavior. While the majority of youth participants in the Ithaca Focus Group expressed a strong feeling that global warming is occurring, a couple of participants in the New York City Focus Group voiced confusion due to the multiple perspectives presented by different information sources. Comments from members who expressed doubts about the phenomena include:

Yes, I believe that it is happening, but I also believe there is a very small chance that it is in our heads. – New York City Youth Focus Group Member

I feel like that too. There was an ice age and even though there really weren't humans back then, things really heated up. – New York City Youth Focus Group Member

I am pretty sure [global warming is happening]... Because of some media or scientists saying its crazy, but other saying it's more of a problem it's hard to determine who's right. – Ithaca Youth Focus Group Member

Most members of the Ithaca Adult Focus Group said that they are confident that climate change is happening, and a couple described everyday experiences that led them to believe that climate change is happening. Members of the New York City Parent Focus Group disagreed with one another in their response to whether or not global warming is happening. Like youth in the Ithaca Focus Group, participants indicated that they are unsure about the phenomena because of conflicting information. Comments from participants in the adult groups who expressed doubts about the phenomena include:

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I agreed with “An Inconvenient Truth” until I saw a story about scientists who struck down every idea of Al Gore’s, and Gore never disputed it. – New York City Parent Focus Group member

I believe [global warming] is happening, but as I sit here and listen to others I question it. I want to hear data from multiple perspectives. – New York City Parent Focus Group member

I’m not totally sure [climate change is happening] because my dad is conservative politically and he shows me a lot of articles, it’s mostly my father’s influence. It’s always good to be a little open-minded. – Ithaca Adult Focus Group member

Figures 11 and 12 display focus group participants’ ratings for how well informed they feel about the causes of global warming. Across the four groups, all participants rated their level of knowledge as a five or higher, but even within the groups there was considerable variability in their ratings. Participants’ sense of their level of knowledge was further explored by presenting them with excerpts from the Global Climate Change Impacts in the United States report (U.S. Global Change Research Program, 2009), and inquiring as to what information was new to them. Participants in both the youth and adult groups remarked that they were most surprised to learn that “when human influences are removed from [climate model simulations], results suggest that the surface of the earth would actually have cooled slightly over that last 50 years.”

Figure 11: Youth Focus Group
Participants: How well informed do you feel about the different causes of global warming?

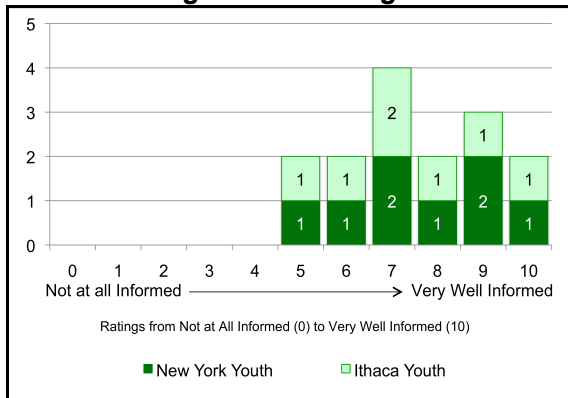
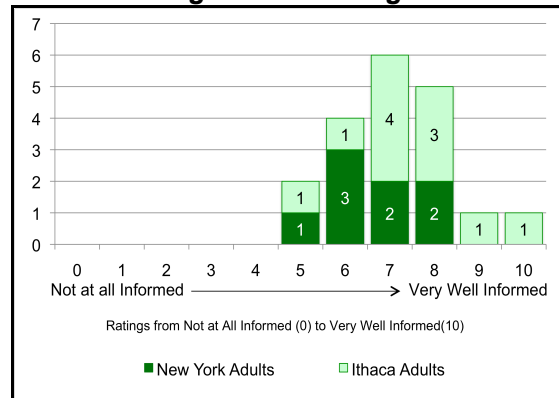


Figure 12: Adult Focus Group
Participants: How well informed do you feel about the different causes of global warming?



Figures 13 and 14 display the focus group participants’ ratings for their level of worry about global warming. While most of the adult and youth focus group participants rated their level of worry about global warming as a five or higher, two members of the New York City Youth Focus Group rated their level of worry as a zero. Comments from participants indicate that these youth are unconcerned because they view the impact of climate change to be so distant in the future that it is not relevant to them and/or because they do not feel empowered to make

I don’t think [climate change] is very important because the impact will come hundreds of years from now. – New York City Youth Focus Group Member

I feel like [climate change] will just happen anyway. – New York City Youth Focus Group Member

a difference. Interestingly, one youth member of the Ithaca Focus Group also noted that she is becoming less worried about climate change as she sees increased awareness about the problem.

Figure 13: Youth Focus Group Participants: How worried are you about global warming?

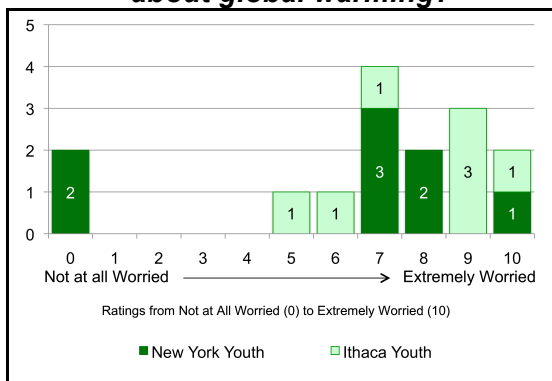
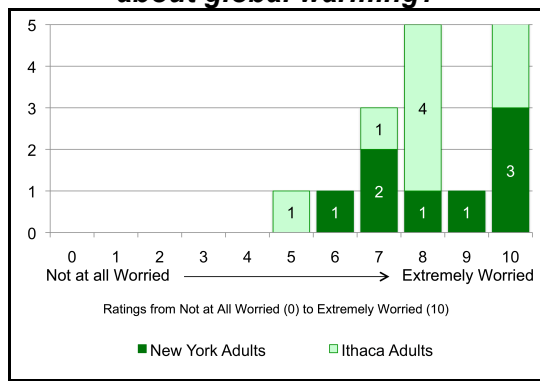


Figure 14: Adult Focus Group Participants: How worried are you about global warming?



Nonetheless, across the groups most participants' comments reflect a strong concern about the problem of climate change:

I'm extremely worried... I have a 13 year old and it's her world... and it's not mine to take from her. I should make it better. – Ithaca Adult Focus Group participant

Climate change is the number one concern for me and its also lifestyles and other factors that contribute to climate change. – Ithaca Adult Focus Group participant

[I'm] pretty worried [about climate change]... I want my kids to grow up with [information about climate change] and to understand it. – New York City Adult Focus Group participant

I'm really concerned... I'm contributing to global warming and I'm concerned. – Ithaca Youth Focus Group participant

Impact of Current Programs & Activities

To begin to assess the impact of current climate change programs and activities, respondents to the visitor survey were asked a series of items related to whether or not they recalled seeing climate change-related content during their visit to the science center and whether they undertook any follow-up activities related to climate change after visiting the science center. The participating science centers were also asked to describe any climate change-related activities that were underway during the period in which visitors were solicited to participate in the online follow-up Visitor Survey.

As shown in Table 2, the participating C3 science centers varied with regard to amount and types of climate change programs that were underway. Four (4) of the 11 science centers reported that they did not have any climate change-related activities underway. The remainder reported a variety of exhibits, a Science on a Sphere program, special events, and an IMAX movie.

Table 2: Climate Change Related Exhibits & Activities during the Period of Visitor Email Data Collection

Science Center	Climate Change-Related Exhibits & Activities
Bishop Museum	<ul style="list-style-type: none"> • Global warming exhibit • Science on a Sphere – Climate change show
Chabot Science Center	None
Edventure	None
Maryland Science Center	<ul style="list-style-type: none"> • Terralink Earth Science News exhibit • Antarctica – Art and words from NSF writers and artists
Museum of Discovery & Science	<ul style="list-style-type: none"> • Exploring our Oceans programming: series of programs on the future of oceans • Science Café programs about recycling
New Mexico Museum of Natural History	<ul style="list-style-type: none"> • Paleoclimatology exhibit in Hall Exhibits • Poster advertising citizen science climate change program posted
New York Hall of Science	None
Reuben H. Fleet Science Center	None
Sciencenter	<ul style="list-style-type: none"> • Special evening event: Teen Earth Day Event
St. Louis Science Center	<ul style="list-style-type: none"> • Grand Canyon Adventure IMAX • Ends of the Earth: from Polar Bears to Penguins traveling exhibit
The Franklin Institute	<ul style="list-style-type: none"> • Earth Fair

Respondents to the Visitor Survey were asked to indicate whether an interest in learning more about climate change influenced their decision to visit the science center and whether or not they participated in any activities related to climate change during their visit. They were also asked to indicate any follow-up activities related to climate change that they had undertaken since visiting the science center.

Twenty point one percent (20.1%) indicated that an interest in learning more about climate change influenced their decision to visit the science center (N=279). Due to the low sample size for many of the participating science centers, it is difficult to interpret these results by science center. However, in general, the percentage of respondents from each science center who said that an interest in climate change influenced their decision to visit is roughly in proportion to the science center’s overall contribution to the sample (i.e. one science center does not appear to be responsible for drawing the majority of visitors with an interest in climate change).

Approximately half of the respondents (49.1%) recalled seeing an exhibit or participating in an activity/lecture related to climate change during their visit to the science center. Like the results for visitors’ decisions to visit the science center, the percentage of respondents who recalled seeing an exhibit or participating in an activity related to

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climate change for each science center was roughly in proportion to the science centers' overall contribution to the sample.

To begin to understand the impact of a visit to the science center on visitors' interest and engagement in activities related to climate change, visitors were asked to report whether they had undertaken any follow-up learning experiences in the time since they had visited the science center. Table 3 displays the percentages of visitors who reported undertaking each activity for respondents based on whether or not they recalled seeing an exhibit or activity related to climate change during their visit. For each follow-up activity, the percentage was higher for visitors who recalled seeing an exhibit/activity related to climate change than it was for those who did not recall an exhibit/activity related to climate change, and the difference between percentages was statistically significant for *watch[ing] a documentary movie about climate change, read[ing] a book about climate change, read[ing] a newspaper article about climate change, and look[ing] up information about climate change (online or in a library).*⁹

Table 3: Follow-up Activities to Science Center Visit

Since visiting [the science center] have you...	Recalled seeing exhibit/activity related to climate change (n=129)	Did <u>not</u> recall seeing an exhibit/activity related to climate change (n=138)
Participated in an event/lecture related to climate change	9.3%	5.1%
Watched a documentary movie about climate change	24.0%*	11.6%
Read a book about climate change	13.2%*	3.6%
Watched a television news story about climate change	32.6%	29.0%
Listened to a radio news story about climate change	23.3%	23.3%
Read a newspaper article about climate change	42.6%*	23.9%
Looked up information about climate change (online or in library)	27.1%*	15.9%

*Results are statistically significant at the alpha \leq .05 level, based on a Chi-Square analysis.

Although these results suggest that visitors are more likely to undertake follow-up activities related to climate change when a trip to the science center includes an exhibit or activity related to climate change, they should be interpreted with caution. Respondents who recalled seeing a climate change related exhibit or activity on their visit to the science center were also more likely to report that an interest in learning more about climate change influenced their decision to visit the science center (30.4% compared to 9.9%), and that they had participated in a science-center hosted event or activity focused on climate change in the past six months (9.2% compared to 3.5%).¹⁰

⁹ Results are statistically significant at the alpha \leq .05 level based on a Chi-Square analysis.

¹⁰ Results are statistically significant at the alpha \leq .05 level based on a Chi-Square analysis.

Thus, some members of the group of visitors who recalled a climate change-related exhibit or activity may have had an interest in climate change prior to visiting the science center that pre-disposed them to undertake follow-up activities related to climate change after visiting the science center.

Current Climate Change Information Sources

The focus groups were used to explore the questions of where and how youth and adults currently learn about climate change and how they determine that the source of information is trusted. These findings are summarized below.

Sources of Information. Members of both youth focus groups said that they learn about climate change in school/science class, on the internet (through ads, websites that friends recommend, and websites such as stumbleupon.com), through discussions with friends and family, on local and national news, from PBS, from books, and from movies such as “The Day After Tomorrow.”

Members of the New York City Parent Focus Group said that they get information about climate change from television (Oprah, the Discovery Channel, the Weather Channel), the internet (online images, CNN “stories of interest,” National Geographic, and featured news stories), newspapers, their children, and publications such as “An Inconvenient Truth.” Members of the Ithaca Adult Focus group said that they hear about climate change on the internet, during local government talks, in casual conversation, and through social networking sites.

A major theme from both the youth and parent focus groups was the significance of discussions about climate change that occur within the school setting and among friends and family members. A number of youth participants noted that school is an important source of climate change information for them, and a few indicated that they share this information at home. Members of the parent group discussed how this flow of information from their children to their homes is central to their understanding of current scientific issues such as climate change.

I bring home information and they give me their opinions and we debate it.
– Ithaca Youth Focus Group Participant

Science is brought out more now, than it was when I was younger. They [my kids] remind me to turn the water and lights off. They teach me about science. – New York City Parent Focus Group Participant

I learn a lot from children’s programming, by watching that with my kids. – New York City Parent Focus Group Participant

I learn a lot of what my kids bring home from school because they’re learning it now when we weren’t exposed to it. – New York City Parent Focus Group Participant

Reliability of Information. New York City Youth agreed that they would trust information about climate change in a science museum but that they would be less likely to trust sources such as Wikipedia, a blog, or discussions on television. Members of the

Ithaca Youth Focus Group said that they do rely on online resources and that they look for websites that end with “.org,” “.edu” or “.gov” as sites that they can trust. Others said that they look for the dates of publication to ensure that information is recent.

The adult groups differed in their opinions of reliable sources of information. Several members of the New York City Parent group expressed a strong distrust of both governmental and university sources of information, and a preference for information provided by private organizations. In contrast, several members of the Ithaca Adult Focus Group said that they trust information from universities or government agencies of which they have prior knowledge. They noted that in determining the reliability of a source they consider the funding source for the research, and compare the information to their prior knowledge to determine if it sounds reasonable.

I really don't trust anybody. I have to see it for myself, in facts and figures. I'd have to hear from several sources, credible sources. – New York City Parent Focus Group members

I'd want private research because I don't trust the government. – New York City Parent Focus Group members

I think more than one set of arguments would confuse things. – New York City Parent Focus Group members

Visitor Interest in Climate Change Programs & Activities

Both the Visitor Survey and the focus groups explored visitors' interest in programs and activities related to climate change. These findings are summarized separately below.

Visitor Survey Findings

To begin to understand differences in visitors' interests in science center programs and activities based on beliefs about climate change, the analysis of data related to interest in climate change programs/activities and topics was undertaken separately for groups based on how sure they were that global warming is happening. For this analysis, respondents who provided a response of “very sure” or “extremely sure” were categorized as *Confident* and respondents who provided a response of “somewhat sure” or “not at all sure” were categorized as *Not Confident*. Table 4 displays the percentage of respondents who expressed an interest in a series of climate change-related programs and activities. Across all of the programs and activities, members of the *Confident* group was more likely to express an interest in the program or activity than were members of the *Not Confident* group. For both groups, respondents were most likely to express an interest in *hands-on activities for families as a part of a visit to the science center and an exhibit for families*.

Table 4: Climate Change Programs & Activities of Interest based on Beliefs about Climate Change

Percentage Reporting "Interested" or "Very Interested"	Not Confident (n=95)	Confident (n=157)
Hands-on activities for families as part of a visit to the science center	37.1%	68.6%
An exhibit for families	31.3%	55.9%
Weekend events for families	26.0%	54.3%
Science camps for children	21.6%	51.6%
After-school programs for children	20.0%	44.4%
Evening events for families	19.6%	34.8%
One-time lectures (for older children & adults)	12.5%	26.9%
Lecture series (for older children & adults)	11.5%	22.9%

Figure 15 displays the climate change topics of interest to the *Confident* and *Not Confident* groups of respondents, rank ordered by the percentage of respondents who ranked the topic first or second out of the list of seven. Both groups expressed an interest in programs and activities related to *the impact of climate change on human health* and *current evidence for climate change*. However, the most frequent response for the *Not Confident* group was *how scientists study climate change*, while only 25.9% of the *Confident* group ranked this topic as first or second.

Figure 15: Climate Change Topics of Interest based on Beliefs about Climate Change

Confident Group (n=157)	Not Confident Group (n=93)
The impact of climate change on human health (43.3%)	How scientists study climate change (46.8%)
The impact of climate change on biodiversity (32.1%)	Current evidence for climate change (locally & globally) (32.6%)
Current evidence for climate change (locally & globally) (29.3%)	The impact of climate change on human health (30.9%)
The impact of climate change on your region (28.7%)	The science of climatology (28.7%)
The science of climatology (27.8%)	The impact of climate change on your region (24.7%)
How scientists study climate change (25.9%)	The impact of climate change on biodiversity (20.2%)
The impact of climate change on urban areas (17.8%)	The impact of climate change on urban areas (9.7%)

Note. Percentage shown in parentheses is the percentage of respondents who ranked the topic 1st or 2nd out of the seven topics.

Focus Group Findings

Focus group participants were asked to discuss the climate change programs and activities and topics that were of interest to them. In addition, the focus group discussions provided important insights into the nuances of how science centers should present information related to climate change for public audiences. Major themes related to programs and activities, topics, and nuances of presentation are summarized below.

Programs and Activities. To facilitate the focus group discussion regarding potential climate change activities, focus group participants were asked to review and discuss a series of statements about potential roles for science centers with regard to communicating climate change and they were asked to watch two brief videos that were produced for the C3 Collaboration. The purpose of showing the videos was to determine appropriate content, formats, and venues for distributing brief informational videos about climate change.

Members of the adult focus groups were asked to review the four statements about potential directions for science centers shown in Figure 16. Adult focus group participants particularly liked the idea of science centers developing partnerships with K-12 schools. All of the New York City Focus Group participants agreed that K-12 students should learn about climate change in school, and some participants indicated that school-based programs provide an avenue for reaching the families of school-aged children as well.

Figure 16: Adult Focus Group Discussion Ideas – Potential Roles for Science Centers in Communicating Climate Change

Idea #1. Hands-on exhibits and activities for families and children in grades K-12 that demonstrate the science of climate change and current research on how to reduce the effects of global warming.

Idea #2. Community meetings to provide opportunities for adults and teens to interact with climate scientists, local experts, and fellow citizens to learn more about climate change, how it may affect them, and how they can plan for it.

Idea #3. Partnerships with K-12 schools to provide innovative curricula that uses hands-on activities and up-to-date videos to teach students about the science of climate change and what they can do to reduce the effects of global warming.

Idea #4 Exhibits and events (e.g. lecture series) for adults and older youth that present the public policy issues related to climate change – highlighting current public policy initiatives and the controversy that surrounds them.

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Adult focus group participants from both New York City and Ithaca were concerned about the potential impact of science center-hosted community meetings. The participants in the New York City Focus Group said that they would not attend a community meeting about climate change due to competing priorities for their time, and participants in the Ithaca Focus Group voiced the concern that these events would be “preaching to the choir.” Participants from both groups seemed to feel that the community meeting forum would have limited impact because they would not be well attended by community members who were not already engaged in the issue of climate change. Across both groups, participants largely agreed that Idea #3 is represents the most likely avenue for reaching an audience on a large scale, but they also indicated that the ideas will serve different audiences and the problem calls for a multi-pronged approach.

[Idea] number three is where it starts. It's a good idea to get other ideas started. – New York City Adult Focus Group participant

Science centers should go outside of what they're doing, to go out into the public more. There needs to be another outlet. – New York City Adult Focus Group participant

The idea of partnership with the schools [is one of my favorite ideas]. You're going to reach out to everyone in the schools. In all the other ideas you have to have people come to you. – Ithaca Adult Focus Group participant

None of them are really effective without the other... There are plenty of parents that have kids who need to both relate to kids about the issue and relate to themselves as well. – Ithaca Adult Focus Group participant

Adult focus group participants reacted positively, but not enthusiastically to the *Early Birds and Springtime* video. Some participants said that this form of video is a good way to engage the public in the issue of climate change because the approach is “not abrasive.” A number of participants said that viewing the video would lead them to seek more information about climate change. The adult participants felt that the *Teens, Frogs, and Climate Change* video would be most appealing to youth because they can “identify with animals at a young age,” and “the empathy they can start feeling for these things at a young age is important.” Adult participants recommended using these types of vides in schools, as a PSA on television, in science centers, on websites.

Participants in the youth focus groups were asked to review the ideas for science centers listed in Figure 17. Youth focus group members noted that they particularly liked Idea #2 and other ideas that involve taking action. They said that they are most interested in programs that help them to understand what they can do in their daily lives to help reduce global warming and to become more aware of careers that help to reduce global warming and plan for climate change. One participant suggested that a contest related to these ideas would garner interest from youth. These comments reflect a desire for programs that motivate youth to take action. Like participants in the adult focus groups, participants in the youth focus groups also noted that school-based programs provide a good opportunity to reach children across a broad spectrum of ages.

Figure 17: Youth Focus Group Discussion Ideas – Potential Roles for Science Centers in Communicating Climate Change

A. Science centers should develop exhibits, activities, and resources for young people that provide information about...

1. Scientific evidence for global climate change and predictions for future climate change.
2. What they can do in their daily lives to help reduce global warming.
3. Careers that help to reduce global warming or plan for climate change.

B. Science centers should develop programs and events that provide young people opportunities to...

4. Support scientific research about climate change by collecting data.
5. Meet with climate scientists, local experts, and other community members to discuss climate change and how they can plan for it.
6. Participate in programs at their schools to help reduce global warming.

The facts are what you should continue with, but to draw the interest of the kids, you should try to make it an entertaining and hands-on experience.

– New York City Youth Focus Group Member

Think of ways to make kids feel like they are making a difference.

– New York City Youth Focus Group Member

Less lengthy projects are more appealing. – Ithaca Youth Focus Group member

I don't like watching a presentation, but I'll have a conversation about it.

– Ithaca Youth Focus Group member

Although members of both the New York City and Ithaca Youth Focus Groups agreed that the *Early Birds and Springtime* video presented new information, Ithaca youth did not feel that they could connect to the content and format of the video. They found the *Teens, Frogs, and Climate Change* video more appealing because it showcased a program involving teenagers working to understand the effects of climate change. The New York City youth members said that they would imagine seeing short videos about climate change on websites such as Youtube and Wikipedia and as a part of their science classes. They noted that these videos wouldn't work as well in a science centers because they would probably walk away from the video before it was completed.

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Topics. Participants in the youth and adult focus groups were asked to discuss climate change topics on which they would like additional information. Participants in the adult focus groups expressed an interest in two distinct topics related to climate change: 1) information about climate model simulations; and 2) information about what individuals can do to prevent climate change. Participants in the Adult New York City Focus Group in particular, expressed an interest in better understanding the science behind predictions for climate change. These participants noted that they would want more statistics, charts, graphs, and data to support statements about global warming trends. Other participants agreed that they would like to see more information on what can be done to prevent climate change.

I would want more information about the models scientists are using to illustrate trends. – New York City Parent Focus Group member

I like seeing information that gives you the opportunity to do something with it... instead of thinking it's just the end and there's nothing we can do.
– Ithaca Adult Focus Group member

Participants in the New York City Youth Focus Group expressed an interest in information about the causes of global warming and predictions for the impact of global warming for their generation and future generations, while participants in the Ithaca Focus Group expressed an interest in information about what they can do to prevent global warming.

People want to know what's going to happen rather than why it's going to happen. – Ithaca Youth Focus Group member

I think fresher information is more inspiring. – Ithaca Youth Focus Group member

We want information on things we can change. – Ithaca Youth Focus Group member

We want to know how to change global warming, because we already know what it is. – Ithaca Youth Focus Group member

Nuances of the Science Center Role. The focus groups provided an opportunity to explore not only public interest in climate change activities and topics, but also to better understand public opinion about how science centers should present information about climate change. Across focus groups, participants overwhelmingly agreed that science centers should play a role in educating the public about climate change. A consistent theme among adult focus group participants, was that science centers must focus on the science behind the issue, and that this focus would lend credibility to their education efforts.

"I would like to see Sciencenter get involved in that type of thing because everyone understands Sciencenter is about science." – Ithaca Adult Focus Group member

I think as long as [science centers] are objective, they'll be more respected by people like us because it's a safe haven... It's important to keep it focused on raw data and the science. – New York City Parent Focus Group member

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Participants in both the New York City and Ithaca Focus Groups indicated that an unbiased presentation of the science behind climate change does not necessitate the presentation of two opposing political perspectives related to the issue. One participant voiced the concern that when popular media discuss the issue, they sometime use information that is based on less rigorous research, simply for the purpose of describing the alternative view. Another participant (in the Adult New York City Focus Group) said that this approach makes “it sound like the scientists don’t have their stories together yet.” Instead the adult focus group members, said that science centers should focus on presenting current scientific findings related to climate change.

I see it as less scientific because the media has to have two different sides of the story. They’re going to present something scientific and something semi-scientific that’s against it. They have to produce an alternative set to balance it. – Ithaca Adult Focus group participant

I don’t like [when both sides of the argument are presented] because people who don’t want to believe it are going to be swayed to believe what feels better to them, that it’s not happening. I think the more compelling data should be upfront. – New York City Focus Group member

I think more than one set of arguments would confuse things. – New York City Focus Group member

Focus group participants were asked to discuss their reactions to the terms “global warming” and “climate change,” and to compare their understandings of and reactions to the two terms. Across the youth and adult focus groups, participants tended to agree that the term “global warming” produces a more emotional reaction and that the term climate change sounds more scientific in nature.

Global warming sounds more serious. It hits harder. – New York City Parent Focus Group member

‘Global warming’ seems more dangerous. ‘Climate change’ can be talked about with less emotion. – Ithaca Adult Focus Group member

I think ‘global warming’ was chosen to raise fear in people. – Ithaca Adult Focus Group member

Global warming is more pop culture. – Ithaca Youth Focus Group member
Climate change is more scientific. – Ithaca Youth Focus Group member

Recommendations

Findings from this examination of the visitor knowledge, attitudes, and interests in climate change, provide insight into the types of programs and exhibits that science centers should be undertaking with regard to climate change. The following recommendations are based on the findings summarized in this report, and are presented to provide guidance for both participating C3 science centers and other informal education organizations that are undertaking climate change-related educational efforts.

Recommendation 1: Leverage the science center visit as an opportunity to engage a broad range of visitors in climate change-related hands-on exhibits and activities.

The vast majority (approximately 80%) of respondents to the Visitor Survey did not visit the science center to seek out more information on climate change. Visitors come to science centers for a variety of reasons, and in this particular sample, the most frequently selected reason for the visit was “seeking a place to bring children” (54.2%, N=273). Most science center visitors appear to be looking for engaging and enriching experiences for their families and are not driven to the science center with a specific scientific question or content area in mind. As a result, the science center environment provides an opportune venue to provide climate change content to a diverse group of learners.

With this in mind, science centers should focus on designing climate change-related exhibits and hands-on activities (e.g. demonstration carts) that can engage a wide array of visitors in climate change topics. Although it is important to design exhibits to meet the needs of a specific target audience, a collection of exhibits or activities should provide multiple entry points to reach visitors who approach the learning experience with different knowledge and attitudes towards climate change. In comparison to the national sample, science center visitors tend to be more confident that global warming is happening and more engaged in the issue, and yet even within the visitor group, there is variation in knowledge and attitudes that should be considered in the design of exhibits and activities.

An important area to consider in the design process is the selection of appropriate climate change-related topics. The results of the Visitor Survey suggest that there are some climate change-related topics that are of interest to visitors who differ considerably in their beliefs about climate change. These include: the impact of climate change on human health, current evidence for climate change (locally and globally), and the impact of climate change on the visitor’s region. In other cases, visitor interest in topics varies based on their underlying knowledge and attitudes. For example, visitors who express less confidence in the fact that global warming is occurring are far more interested in topics that showcase how scientists study climate change. Likewise, focus group members who tended to be more confident that global warming is occurring expressed a desire to see topics that showcase individual efforts that can be used to reduce global

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warming. Science centers should work to engage a wider array of visitors in climate change science by developing exhibits to address these varied interests in climate change.

Recommendation 2: Develop programs to fit the unique climate change interests of distinct public audience groups.

While visitor experiences on the science center floor must be designed to meet the needs of a diverse group of visitors, climate change-related programs should be targeted to meet the needs of distinct audience groups. Findings from the focus groups suggest that public audiences vary in the types of activities in which they are interested based on their underlying knowledge and attitudes towards climate change: Community meetings around the issue of climate change are likely to draw only those audiences that are already interested and engaged in the topic, while partnerships designed to provide programs and activities through K-12 schools (e.g. in afterschool settings, through open houses, etc.) provide an avenue for reaching a broader audience.

Science centers do not need to take a single programmatic approach at the exclusion of other approaches, but should ensure that they map the content and program type to the audience of interest. For example, family science nights that feature hands-on climate change activities, could be used to reach a broad audience in coordination with K-12 schools. In this case, the hands-on activities should include content to engage the diverse range of knowledge and attitudes that is likely to be represented by the attendees at these events. Likewise, because lectures and community climate change meetings are likely to draw audiences who are already engaged in the issue of climate change, these events should focus specifically on topics that appeal to these groups, such as current research on how to reduce global warming and how to mitigate the effects of climate change.

Of special consideration are findings from both the Visitor Survey and the focus groups that suggest that in order to effectively reach groups who are not confident that global warming is occurring, science centers must go to these audiences rather than assume that the audiences will come to them. To do so, science centers should explore integrating climate change-related activities into on-going outreach programs that they host with populations who are not engaged science center visitors. They should also seek innovative partnerships with community organizations that provide potential avenues for this type of service delivery.

Recommendation 3: Focus on presenting the science behind climate change-related topics, relying on and citing credible scientific sources.

The focus group findings presented in this report provide further support to the contention that visitors are looking to science centers to present science policy issues in an unbiased fashion (Wilkening & Chung, 2009). An important finding from the focus groups is that visitors' desire for unbiased information does not imply that they are looking to science centers to provide "opposing" perspectives of the issue. In fact, public audiences are sometimes confused by the presentation of multiple perspectives of climate change. Instead, they would like to see science centers focus on presenting current scientific findings related to climate change topics and allow visitors to draw their own conclusions about what the science should mean in terms of policy decisions and individual behavior.

This focus on the science of climate changes requires science centers to present only information that has been reported by credible scientific sources. Although, at face value, this would seem to be an easy task, focus group findings suggest that visitors are likely to vary in their views with regard to which sources are credible. For example, while some visitors will see government agencies, such as the National Oceanic and Atmospheric Administration (NOAA), as trusted sources of information, others may view these agencies as subject to political influences. Program and exhibit developers will need to make careful choices in the selection of research on which to base climate change-related content. One option for addressing concerns about the credibility of information is to ensure that exhibits and programs include information on the methods used to support the scientific findings.

Clearly, as found in the Reach Advisors study, science center visitors are interested in the issue of climate change, and by and large, they would like to see science centers address this issue through programs and exhibits. As science centers move forward in their efforts to educate the public about climate change they must do so with careful attention to the distinct needs of different audience groups. This report has taken steps towards specifying the type of exhibits and programs that are likely to best meet visitors' interests and needs based on their current knowledge and attitudes. Future audience research for the Communicating Climate Change project will focus on providing a more detailed exploration of these distinctions and a better understanding of the impact of climate change exhibits and programs for visitor audiences.

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- National Research Council . (2009). *Learning Science in Informal Environments: Places, People, and Pursuits*. Washington DC: National Academies Press: Bell, P., Lewenstein, B., Shouse, A., Feder, M. A.
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- Wilkening, S. and Chung, J. (2009) *What visitors want to know about current science*. ASTC Dimensions, September/October, 2009, Association of Science-Technology Centers Incorporated.

Appendix: Item-Level Visitor Survey Results

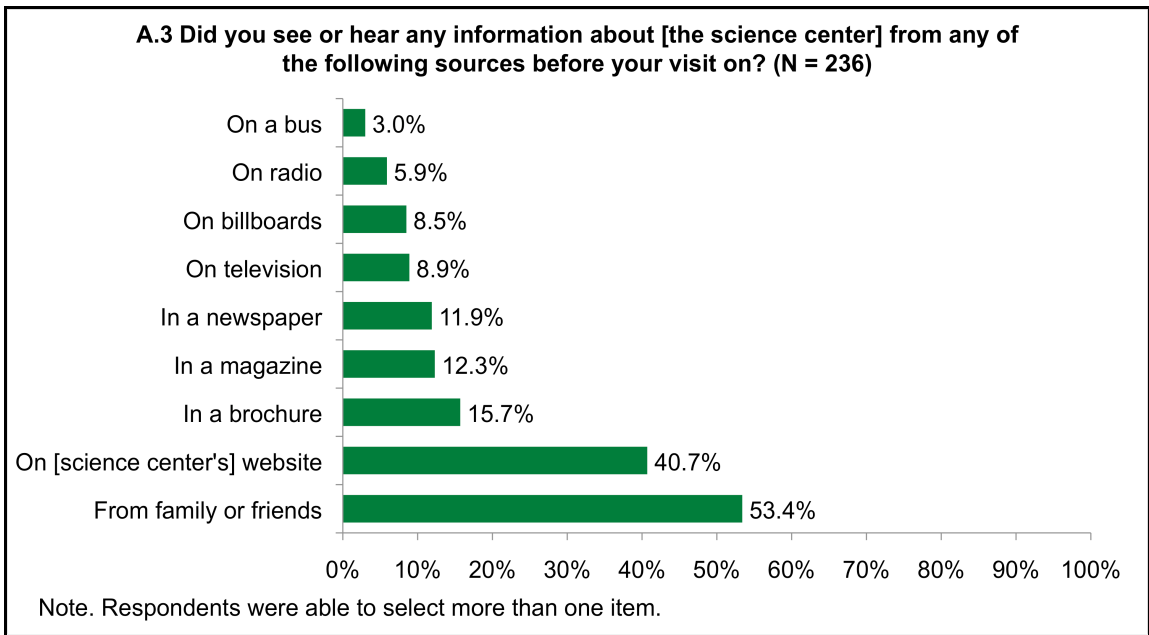
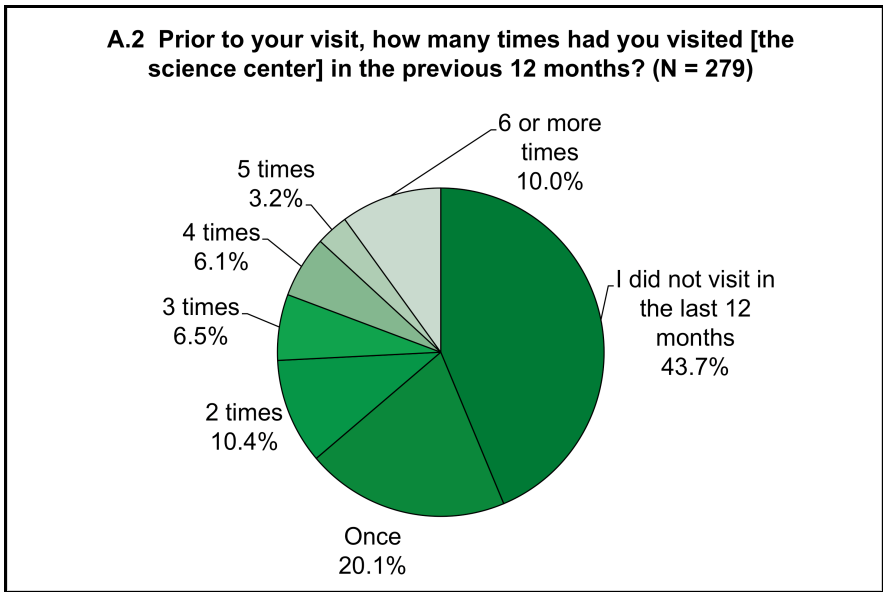
The following pages provide item-level results for the 2009 Visitor Survey. The response rates for the survey are summarized in the table below.

Survey Response Rate Summary

Science Center	Valid Emails Collected	Survey Response Rate	Percentage of Overall Sample
Overall	1314	22.4%	100%
Maryland Science Center	270	25.9%	23.8%
St. Louis Science Center	258	20.5%	18.0%
Reuben H. Fleet Science Center	161	24.2%	13.3%
New York Hall of Science	202	17.8%	12.2%
Edventure	101	24.8%	8.5%
Bishop Museum	82	23.2%	6.5%
Chabot Science Center	51	33.3%	5.8%
Sciencenter	33	51.5%	5.8%
Museum of Discovery & Science	78	10.3%	2.7%
The Franklin Institute	28	25.0%	2.4%
New Mexico Museum of Natural History & Science	50	6.0%	1.00%

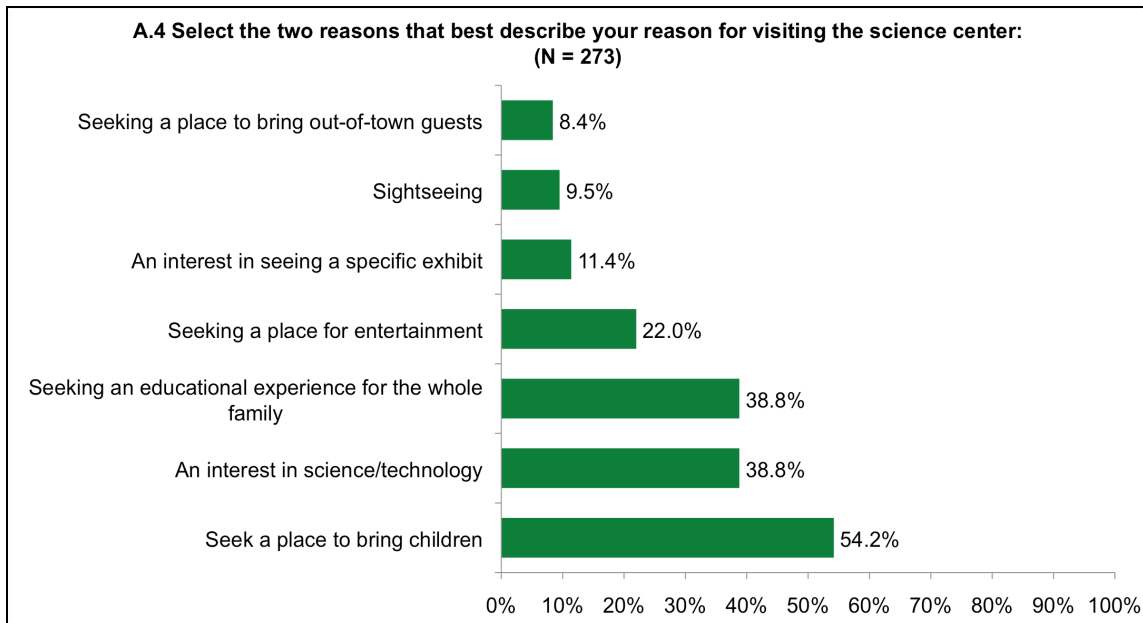
Note. All results displayed as *National Sample* are from “Global warming’s six Americas: An audience segmentation analysis” (Leiserowitz et. al., 2009).

A.1 Were you a member of [the science center] at the time of your visit? (N = 278)	
Members	19.4%
Non-Members	80.6%



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A.5 Did an interest in learning more about climate change influence your decision to visit [science center]? (N = 278)

Yes	20.10%
No	79.90%

A.6 Do you recall seeing any exhibits or participating in any activities or lectures related to climate change during your visit to [science center]? (N = 279)

Yes	49.10%
No	50.90%

A.7 Please briefly describe anything that you saw or did related to climate change on your visit to [science center]? [Open-ended – Omitted]

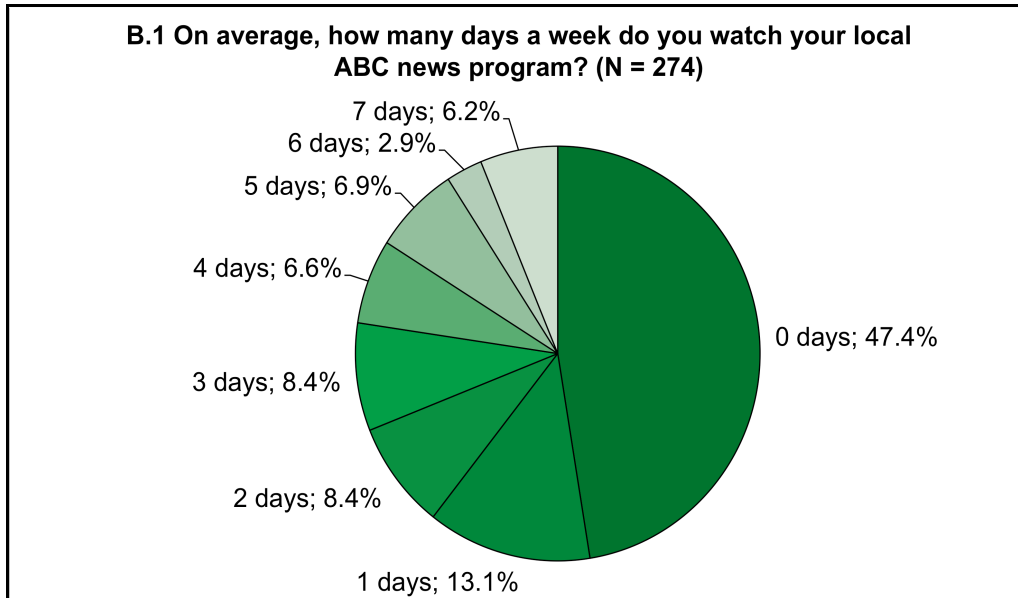
A.8 Other than your visit to [science center] on [date], have you participated in any events or activities at [science center] that focused on climate change during the past 6 months? (N = 274)

Yes	6.20%
No	93.80%

A.9 Please briefly describe any climate change related events or activities that you participated in at [the science center] in the past 6 months. [Open-ended – Omitted]

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B.2 During the last six months, have you seen a story about climate change on your local ABC news network? (N = 274)

Yes	26.30%
No	73.70%

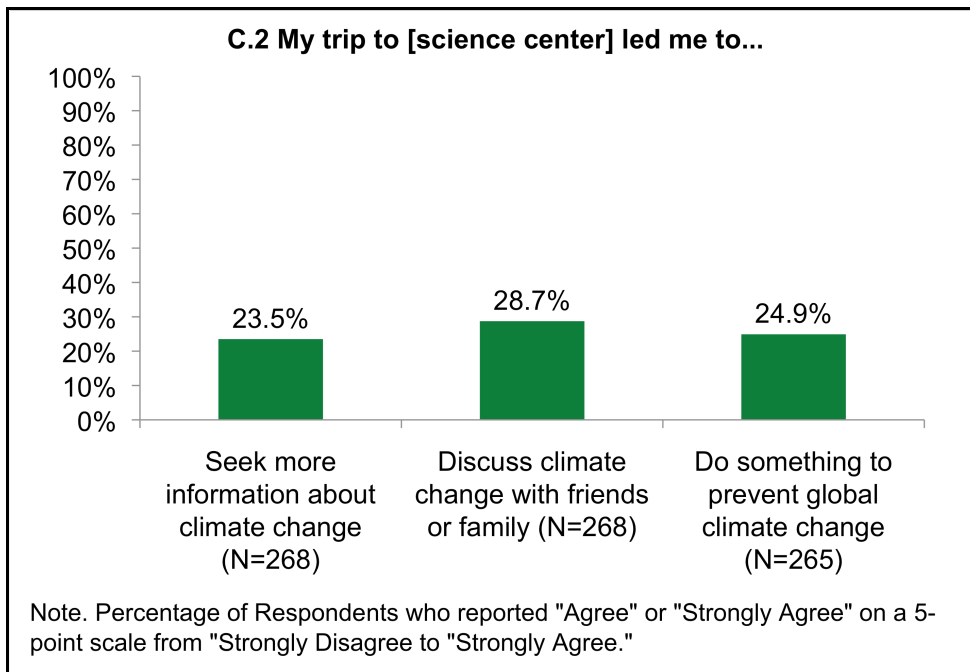
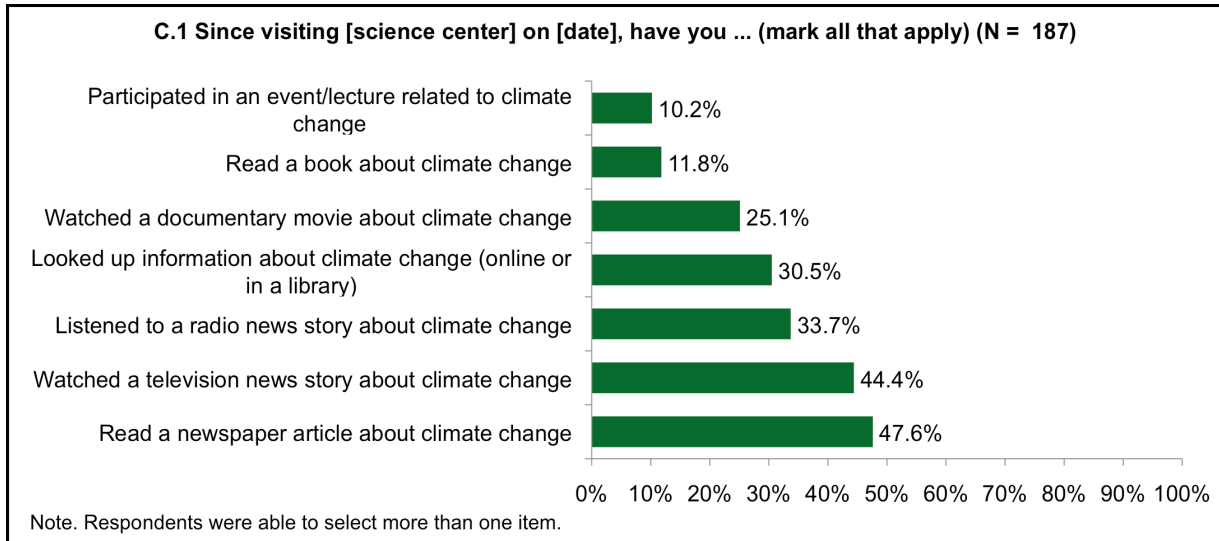
B.3 What do you recall about the news story? [Open-ended, Omitted]

B.4 Did this story influence your decision to visit [science center]? (N = 72)

Yes	11.10%
No	88.90%

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C.3 If you did something to prevent global climate change, what was it? [Open-ended, Omitted]

D.1 What do you think? Do you think that global warming is happening? (N = 269)

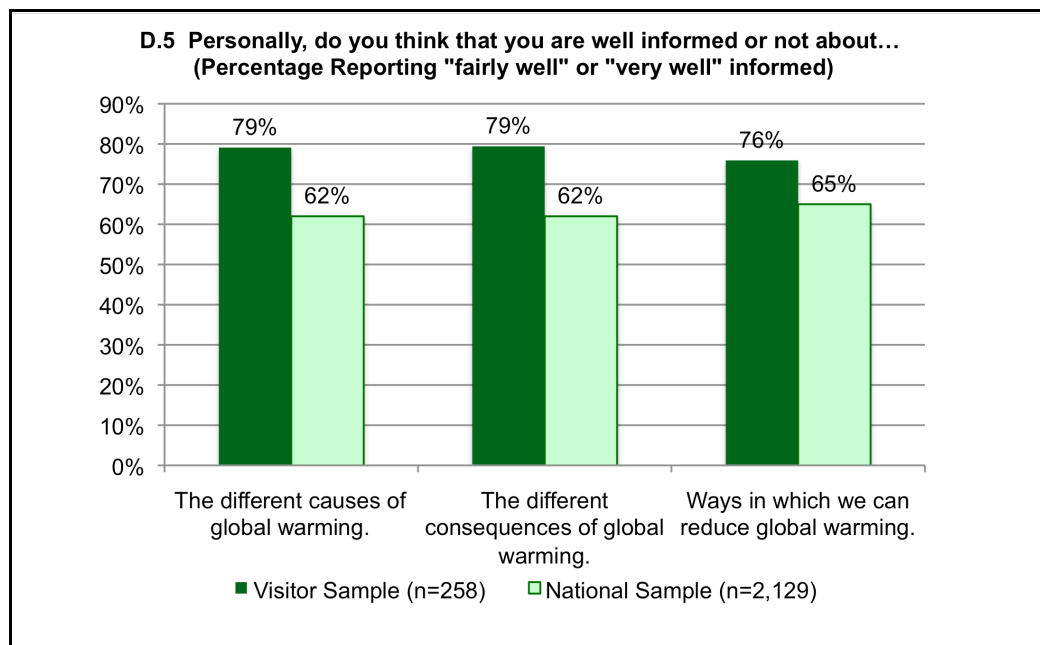
Yes	78.4%
Don't know	11.2%
No	10.4%

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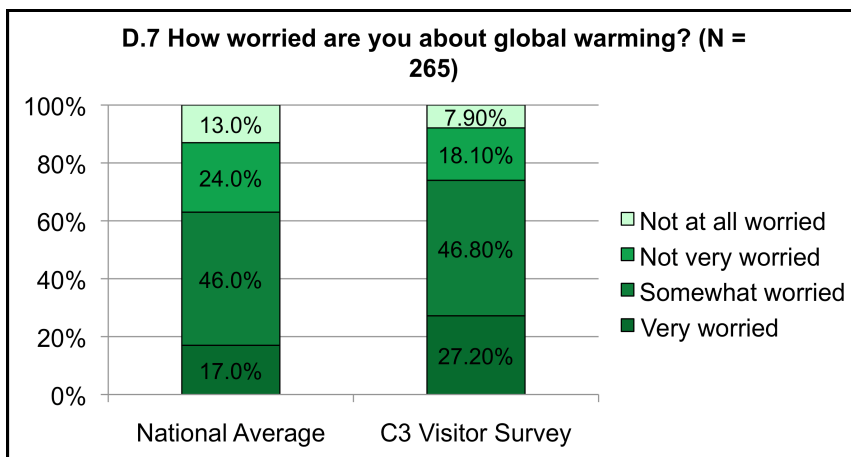
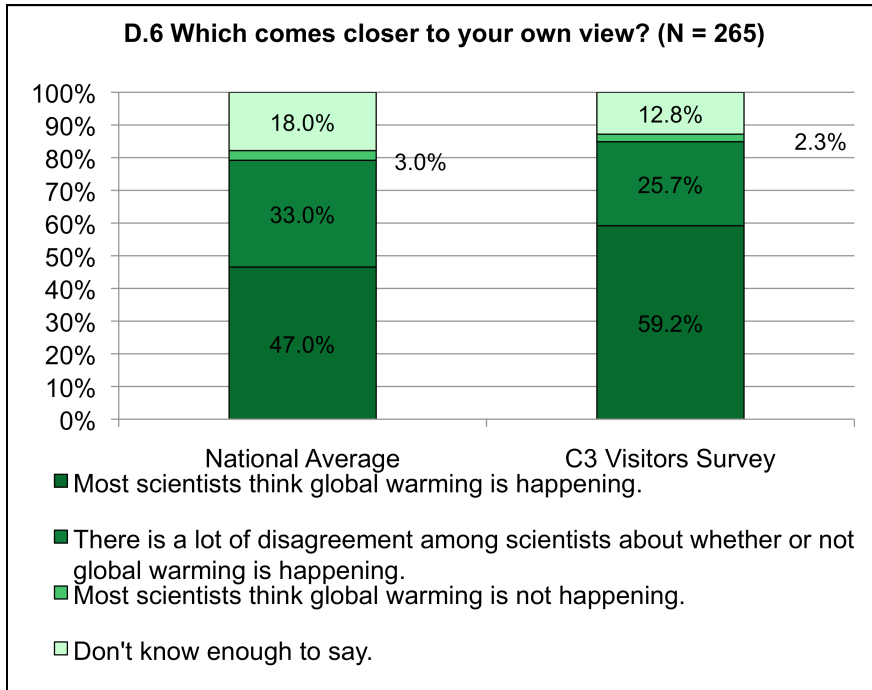
D.2 and D.3 How sure are you that global warming is (or is not) happening? (N = 269)		
	National Sample	C3 Visitor Survey
Extremely sure global warming is happening	25%	34.6%
Very sure global warming is happening	27%	27.1%
Somewhat sure global warming is happening	12%	16.4%
Not at all sure global warming is happening	3%	0.4%
Not sure	18%	11.2%
Extremely sure global warming is not happening	1%	1.5%
Very sure global warming is not happening	4%	2.2%
Somewhat sure global warming is not happening	3%	4.8%
Not at all sure global warming is not happening	3%	1.9%

D.4 If global warming is happening, do you think it is... (N = 262)		
	National Sample	C3 Visitor Survey
Caused mostly by human activities	57%	66%
Caused by human activities and natural changes (volunteered)	5%	-
Caused mostly by natural changes in the environment	33%	18%
None of the above because global warming isn't happening	3%	4%
Other (please specify)	1%	13%



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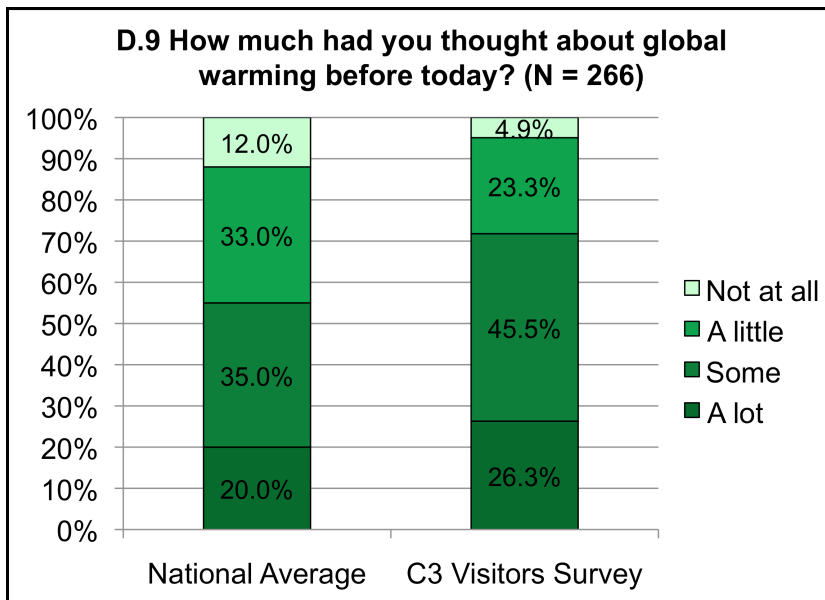
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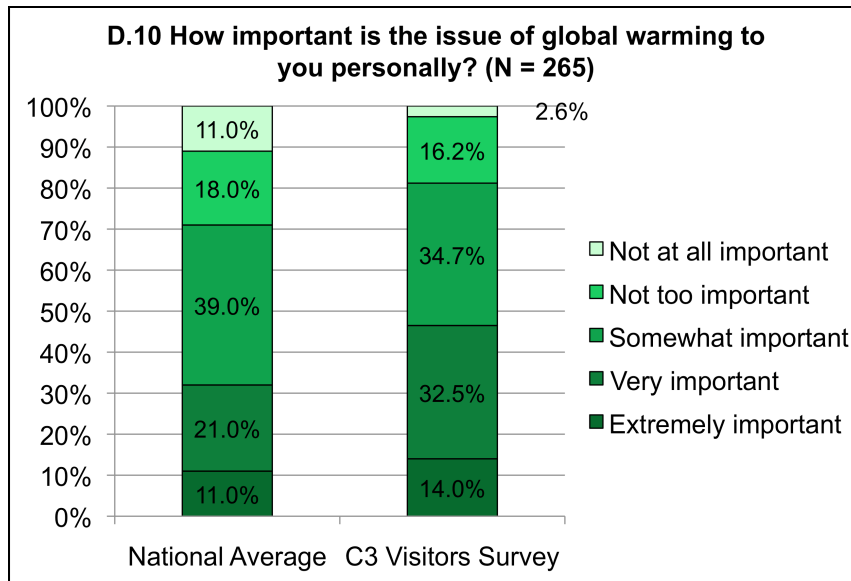
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D.8 How much do you think global warming will harm:										
	A great deal		moderate amount		Only a little		Not at all		Don't know	
	National	C3	National	C3	National	C3	National	C3	National	C3
You personally (n = 262)	10%	18%	22%	33%	24%	31%	22%	13%	23%	5%
Your family (n = 261)	11%	23%	24%	34%	23%	27%	19%	12%	23%	5%
Your community (n = 263)	13%	25%	26%	40%	21%	21%	17%	10%	23%	5%
People in the United States (n = 263)	22%	31%	28%	39%	15%	18%	14%	7%	22%	5%
People in other modern industrialized countries (n = 261)	22%	33%	28%	40%	13%	16%	13%	7%	24%	5%
People in developing countries (n = 263)	32%	48%	22%	23%	11%	17%	13%	6%	23%	6%
Future generations of people (n = 263)	44%	67%	17%	16%	7%	9%	10%	3%	22%	5%
Plant and animal species (n = 263)	46%	65%	17%	16%	8%	10%	9%	3%	20%	6%



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D.11 On some issues people feel that they have all the information they need in order to form a firm opinion, while on other issues they would like more information before making up their mind. For global warming, where would you place yourself? (N = 266)

	National Average	C3 Visitors Survey
I do not need any more information	18%	30.8%
I need a little more information	22%	33.1%
I need some more information	30%	26.3%
I need a lot more information	30%	9.8%

E.1 On a scale from 1 to 5, how interested are you and your family in the following types of programs and activities about climate change...

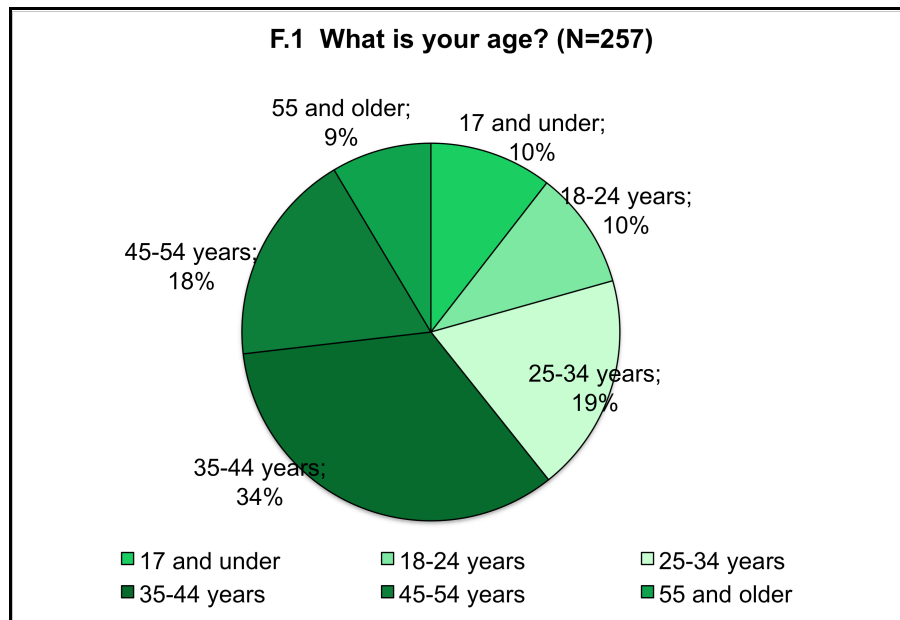
Rank	Response	"Interested" or "Very Interested"
1	Hands-on activities for families as a part of a visit to the science center (n = 256)	56.6%
2	An exhibit for families (n = 257)	46.7%
3	Weekend events for families (n = 258)	43.8%
4	Science camps for children (n = 258)	40.3%
5	After-school programs for children (n = 257)	35.4%
6	Evening events for families (n = 258)	29.1%
7	One-time lectures (for older children and adults) (n = 256)	21.5%
8	Lecture series (for older children and adults) (n = 253)	18.5%

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E.2 Please rank the following list of topics for programs and activities in which you would like to participate.

(Rank Ordered)	Percentage Ranking as a "1" or "2"
The impact of climate change on human health	39%
How scientists study climate change	34%
Current evidence for climate change (locally & globally)	30%
The science of climatology	28%
The impact of climate change on your region	27%
The impact of climate change on biodiversity	27%
The impact of climate change on urban areas	15%



F.2 Respondent Gender (N = 256)

Male	34.8%
Female	65.2%

F.3 What is your zip code or postal code? [Omitted]

