MuseumsForward

Climate change at home: the impact of environmental museum exhibits on sense of place

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Abstract

The reality of climate change has become impossible to ignore, and increasingly people are asking what can be done to strengthen individual and community-level climate action. The purpose of this study was to explore whether and how museum exhibits that are focused on their local environment can influence people's relationship to that environment, particularly when it comes to community involvement and environmental concern. "Relationship to environment" was framed using place attachment, a psychological theory defined as the complex, emotional connections people form with the specific places they find meaningful. To investigate whether museums could influence place attachment, 162 visitors at three distinct institutions in the Puget Sound region—a natural history museum, an art museum, and an aquarium—were surveyed 4-6 weeks after their museum visit. Findings revealed that even a month after visiting an exhibit, people largely still remembered and felt impacted by the exhibits' local focus and environmental messaging. They had been thinking about, talking about, and noticing things that reminded them of the exhibit in their daily lives, and, perhaps most importantly, they felt the exhibit had positively impacted their connection to their local area as well as their feelings of environmental concern and stewardship motivation. These results are encouraging; they demonstrate that people want to know about environmental impacts and make what difference they can in their communities.

Keywords

place attachment; climate change communication; environmental education

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Introduction

"Climate change is fundamentally a crisis of how we relate to the world around us – it's a crisis of home."

– Madeline Ostrander, *At Home on an Unruly Planet*

The Reality of Climate Change

2023 was Earth's hottest year on record (Chow, 2024). The reality of climate change has become impossible to ignore, especially as impacts from extreme weather events, sea level rise, and biodiversity loss are felt with increasing frequency across the globe (Nullis, 2023). More people are having direct, personal experiences with climate change-related events, and "climate change" as a concept is becoming less abstract and more visible in everyday life (Wong-Parodi & Berlin Rubin, 2022). While the threats posed by unmitigated climate change are serious and myriad, reports like the United States' Fifth National Climate Assessment (Jay et al., 2023) have focused on solutions, both in progress and projected, at multiple levels of influence across the country. Many of those solutions—mitigation and adaptation efforts—are regional, and demonstrate that individuals and communities have a role to play in climate action (Sweet, 2024). But how?

Scientists, policymakers, educators, and countless others are asking what can be done to strengthen individual and community-level climate change engagement (Roser-Renouf & Maibach, 2018). Climate change engagement is defined as "an ongoing personal state of connection with the issue of climate change" (McGhie et al., 2020, p. 183). This can be explored and influenced in many ways, and one avenue particularly salient for the research this article describes is in the realm of climate change communication, particularly in informal learning institutions like museums. How can we convey the urgency of climate change and importance of action without giving way to despair? This article describes a study designed to understand whether and how museums with exhibits focused on their local environment can influence visitors' sense of place attachment and, in doing so, motivate climate change engagement.

Climate Change Communication in Informal Learning Institutions

One sector in which climate change communication has seen increasing exploration is informal education – including museums, zoos, aquaria, and parks (Sutton & Robinson, 2020). There is a need to engage visitors on climate change topics, both in order to stay relevant to increasingly concerned audiences (Lyons & Bosworth, 2019) and also in recognition of the fact that museums are uniquely situated to both increase awareness of and facilitate dialogue on climate-related issues (Cameron et al., 2013; Fine, 2023).

For the past several decades, there has been a particular focus on environmental topics in nature-based institutions (Swim et al., 2017). In zoos and aquaria, programming and interpretation related to increasing visitor knowledge of habitat and wildlife conservation has been especially prominent (Ardoin et al., 2013; Falk & Adelman, 2003), and research shows that visits to these institutions often increase people's intentions towards conservation-related behaviors (Ardoin et al., 2013; Falk, 2007). In other types of museums, like natural history and science museums, it has also been shown that museum visitors typically have increased knowledge of climate change topics when compared with non-museum visitors (Leiserowitz & Smith, 2011) and some knowledge gained stays with them at least six months after a visit (Swim et al., 2017). From exhibits that discuss human impacts on the environment (Arfvidsson & Follin, 2020) to programming that discusses climate change processes and causes (Fine, 2023), climate change communication in informal education is an area of incredible breadth.

However, these programs and exhibits are often focused on climate change in a general, global sense, rather than in a specific, local one. For example, zoos and aquaria largely focus conservation messaging on a few, charismatic species (Ardoin et al., 2013) – typically, species whose natural habitats are located across the globe, rather than those who share the locality of the institution promoting them (Mann et al., 2018; Pearson et al., 2013). Think of the number of US-based zoos featuring polar bear or orangutan conservation. Worthwhile, of course, but distant from the everyday American's life. Furthermore, museum exhibits are often focused on general knowledge of climate change topics, such as the global impact of fossil fuel use or the national scale of sea level rise (Fine, 2023), rather than climate change impacts concentrated at a local level. While a zoomed-out approach certainly has value and it is important to understand the global impacts of climate change, research shows that this broad focus may not be the best way to increase climate change engagement.

In a survey of zoo visitors, it was found that when asked about climate awareness and possible mitigation behaviors, visitors had an overwhelming bias towards global climate issues as opposed to local ones (MacDonald et al., 2015). This phenomenon is known as environmental hyperopia, or a biased awareness towards global threats. Environmental hyperopia is "based on people's perception that geographically distant environmental problems are more severe than local problems…[and] people often feel helpless to solve global problems. Environmental action is moderated by control and people believe they do not have control over global issues, thus they do not believe they can be involved in the solution" (MacDonald et al., 2015, p. 124). One opportunity for museums is to emphasize locality in climate change engagement by using exhibits as spaces in which visitors can explore and navigate the psychological distance of climate change (McGhie et al., 2020).

A Local Lens

Research shows that people are often more willing and able to engage with climate change topics when they are focused on that which is most relevant to them personally, as well as that which is most securely within their locus of control. When things feel abstract, temporally or physically distant, or irrelevant, they are said to have high psychological distance (Chu & Yang, 2020). The more future, impersonal, global, and analytical a risk like a threat from climate change seems, the greater an individual's psychological distance from that risk (van der Linden et al., 2015). By decreasing psychological distance, climate change and its impacts are made more urgent, local, and relevant, promoting engagement with climate change topics and actions to mitigate climate change threats (Roser-Renouf & Maibach, 2018). One way to decrease psychological distance is to focus on the personal and the local (van der Linden et al., 2015), and one way to increase engagement with local environments, largely unexplored in museum settings, is to influence and increase individual sense of place attachment.

Place Attachment

What does it mean to care about the place you live? Typically, the more attached we are to a place, the more willing we are to protect it. Place attachment as a psychological theory can broadly be defined as the complex, emotional connections people form with the specific places that they find meaningful (Diener & Hagen, 2022). High place

attachment has been shown to correlate with a deepened sense of community and social connection (Larson et al., 2018) as well as an increase in individual motivation to participate in behaviors that benefit the environment (Upham et al., 2018). Actions that benefit the environment are known in scholarship as pro-environmental behaviors, or PEBs, and can range from personal lifestyle choices to public organization-based actions (Larson et al., 2015). While zoos and aquaria in particular have focused on conservation related PEBs (Johnson, 2020), they again largely focus on global initiatives and distant, charismatic species (MacDonald et al., 2015). One way in which museums could shift focus from a global to a local lens is to highlight local, community based PEBs, increasing both place attachment and visitor intention towards pro-environmental behavior.

The Puget Sound region has been shown to have particularly high levels of place attachment, both amongst long-time and new residents (Trimbach et al., 2022).

> "Strong place attachment is important not only for human wellbeing, but it also motivates ecosystem stewardship. Complex interactions that form a multidimensional sense of place are thus important drivers of stewardship in integrated cultural-ecological systems such as Puget Sound" (Poe et al., 2016, p. 422).

According to Poe et al. (2016), place-making activities, heritage, personal and emotional experiences, and social connections are four key dimensions of place attachment among Puget Sound residents.

Knowing those dimensions, in what ways can informal learning institutions local to this region both foster place attachment and build care for the environment? It is known that spending time in nature can increase sense of place attachment (Harris et al., 2023), but can local, non-outdoor experiences achieve the same effect? This research study hypothesized that there is an incredible opportunity in museum settings to decrease psychological distance, increase sense of place attachment, and facilitate steps towards pro-environmental behavior utilizing locally rooted exhibits.

Framing Exhibits Using Place Attachment

For a long time, a prominent theory in science communication utilized a deficit model – it posited that one of the reasons people don't engage with climate change is because they don't have enough knowledge about it (Leshner et al., 2017). In actuality, people rarely make decisions

based on knowledge or facts alone; there are a variety of factors influencing climate change engagement (Jeon et al., 2023; Myers et al., 2023). So, while museums have been shown to increase knowledge of climate change (Leiserowitz & Smith, 2011), they are also ideal locations to impact both the affective and emotional aspects of climate change engagement. Museums highlight both educational space and space for social, emotional, and community connection, which can both encourage place attachment and foster climate change engagement.

What makes climate change education effective? Research shows that the most impactful programs focus on the personally relevant and meaningful while using active and engaging teaching methods (Monroe et al., 2019). By framing climate change in their local context, museums can use open-ended or free choice learning environments as opportunities for visitors to explore and develop personal connections to place (Achiam, 2013). Research has shown that museums in the past have served as important facilitators of identity development via transformative experience (Garner et al., 2016). Identity development in nature-based formal education programming has also been shown to be effective in transformative education (Cachelin & Nicolosi, 2022; Harmin et al., 2017). What is underexplored is whether informal education spaces can have the same impact on place-based identity development, or more specifically, place attachment.

In the past, museums have harnessed place-based education in a sociocultural sense and have also inspired community-driven social justice action (Tomczuk et al., 2018; Utt & Olsen, 2007). There is strong evidence to support the fact that museums are ideal locations to both support and increase climate change engagement via the concept of place attachment. Furthermore, framing climate change in a local way is not only worthwhile but necessary for many museums in our current climate environment.

Transformative educational experiences and place-based identity development are not only effective ways to motivate pro-environmental behavior, but also feel essential to maintaining hope in the midst of the current climate crisis (Heaton, 2020). Climate change is happening now, and it is affecting us – our home. Fostering care and stewardship for the land we share, understanding that climate change is happening now, in our communities, makes climate change engagement feel both necessary and worthwhile, and is a motivating force in pursuit of a better environment than the one we see today.

Study Purpose

The purpose of this study was to understand whether and how museums with exhibits focused on their local environment can influence people's sense of place attachment four to six weeks after their visit. This research was guided by the following questions:

1. How do individuals reflect on an exhibit dedicated to the local environment in the weeks after their visit?
2. To what extent does visiting an exhibit dedicated to the local environment impact an individual's relationship to their local area?
3. How do exhibits dedicated to the local environment inspire individual environmental engagement or stewardship?

Methods

This study used a descriptive survey design (Creswell, 2018) to understand the long-term impact of local, environmental museum exhibitions on visitors' sense of place attachment. Adult participants completed online questionnaires four to six weeks after their museum visit.

Research Sites

Adult visitors over the age of 18 were recruited from exhibitions at three museums: i) Burke Museum of Natural History and Culture, Seattle, WA; ii) Museum of Northwest Art (MoNA), LaConnor, WA; and iii) Seattle Aquarium, Seattle, WA. At each of these museums, adults were recruited at specific exhibitions that featured a distinct, focused look at the environment and ecology of the Puget Sound region.

Burke Museum of Natural History and Culture

At the Burke Museum, the temporary exhibit *We Are Puget Sound* featured stories from individuals around Puget Sound involved in conservation or climate action. The exhibit showcased photography highlighting people, animals, and nature from across the region, and communicated both the threats they face and the solutions in progress. It was also highly interactive, prompting visitors to commit to a specific action to benefit the Puget Sound.

Museum of Northwest Art

At MoNA, *Surge: Mapping Transition, Displacement, and Agency in Times of Climate Change* highlighted local collaborations between artists and scientists to draw attention to climate change effects on Northwest coastal communities. Art pieces ranged from photographs to paintings to digital and mixed media approaches, but all were specific to Northwestern Washington, and all were based in the science of climate change. Some reflected individual artist's feelings and impressions of seeing climate impacts in their homes, and others were meant to communicate to the viewer how to spot and process the climate impacts around them.

Seattle Aquarium

Finally, at the Seattle Aquarium, *Puget Sound: Unique and Evolving* featured graphic interpretation for the visitor and habitats dedicated to local wildlife. Interpretation in the exhibit area situates the viewer as part of the environment of Puget Sound and, therefore, also part of the solution. This exhibit area also includes several habitats dedicated to local species, such as fish and invertebrates found in Elliot Bay, juvenile salmon in a river watershed habitat, and some charismatic and energetic river otters.

Data Collection Procedures

Participants were recruited at each exhibition through convenience sampling. The researcher visited each site a minimum of three days and attempted to approach every adult visitor as they walked through the exhibition. Participants who agreed to be part of the study were asked for their name and email address so they could be sent an online questionnaire in the weeks after their visit date.

A total of 285 names and email addresses were collected across the three exhibitions. Four to six weeks after the visit, participants were emailed a link to an online questionnaire in Jotform. Two email reminders were sent after the initial email. The questionnaire included both open and closed-ended questions designed to measure the impact of the exhibition on adults' sense of place attachment (see Appendix A for the questionnaire). Survey questions were adapted from several place attachment frameworks in the literature, mainly those from Poe et al. (2016) and Upham et al. (2018). Questions were designed to explore environmental concern and community

involvement as dimensions of sense of place related to feelings impacted or inspired by exhibit experiences.

Participants

A total of 162 adults completed the questionnaire, which is a 57% response rate. The majority (80% n=130) of participants lived in Washington state. Other demographic information was collected from participants to understand to whom results from this study could be generalized. This data is presented in tables below.

Table 1

Participants' gender identity (N=162)

Gender Identity	Frequency
Woman	66% (n=107)
Man	31% (n=50)
Non-binary	2% (n=3)
Transgender	1% (n=1)
Preferred to self-describe	1% (n=1)

Table 2

Participants' racial or ethnic identity (N=161)

Race and/or Ethnicity	Frequency
White/Caucasian	78% (n=126)
Asian/Asian-American	9% (n=14)
Multiple options selected	6% (n=10)
Latinx/Latina/Latino/Hispanic/Chicano	5% (n=8)
African/African American/Black	2% (n=2)
Native Hawaiian/Pacific Islander	1% (n=1)

Table 3

Participants' age (N=162)

Age	Frequency
18-24	14% (n=23)
25-39	30% (n=48)
40-54	18% (n=29)
55-69	17% (n=28)
70-84	15% (n=24)
Did not respond	6% (n=10)

Table 4

Participants' museum visitation frequency (N=161)

Number of times visited museum in the past 5 years	Frequency
First time visitor	60% (n=96)
2-3	22% (n=36)
4-6	9% (n=14)
7+	9% (n=14)

Data Analysis Procedures

Survey data were analyzed based on the type of question asked. Closed-ended responses were quantified and analyzed using descriptive statistics. Responses to open-ended questions were analyzed using emergent coding to identify themes and patterns across responses. The principal researcher read through each question response and sorted them into categories based on the content of the response. Three to six response categories were identified per question, and coding rubrics were created. A faculty advisor evaluated the coding rubrics based on a subset of responses.

Results

Research Q1. How do individuals reflect on an exhibit dedicated to the local environment in the weeks after their visit?

Participants' memories of the exhibit

Two questions prompted reflection on participants' overall impressions and memories of their exhibit visit. First, participants were asked what they remembered most from their visit. Responses were coded into six emergent categories (see Table 5). Table 5 shows that roughly one third of participants' memories were environmental in nature, focusing on local connections, environmental messaging, or calls to action within the exhibits.

Table 5

What participants remembered most about their exhibit experience (N=162)

Description	Example Response	Frequency
Overall experience or specific exhibit element	"Beautiful photographs. Sense of wonder," "Engaging displays for adults and kids."	59% (n=116)

Table 5 (continued)

Local focus of the exhibit	"The details of PNW heritage were so fulfilling," "The orcas and native people who have called the Salish Sea home."	14% (n=26)
Environmental or climate change messaging	"Speaking with my daughter about human caused environmental impacts," "Increased awareness of how much we are losing due to climate change."	12% (n=23)
Call to action	"It made the case for taking action," "the list of ways a person could protect Puget Sound, including actions at home."	7% (n=13)
Connection to personal life or community	"How cool it was to see the cross section of streams I grew up playing in," "It made me think of similar exhibits I've seen."	5% (n=10)
Did not remember visit	"Honestly, I don't remember anything specific," "I don't remember it."	4% (n=7)

Second, participants were asked to describe the exhibit they had visited using three words or short phrases. There were 419 words offered. These words were coded into three, broadly emergent themes. The largest category was general responses describing the exhibit. Of those responses, the large majority of them were positive or neutral towards the exhibit, as illustrated in Table 6. Less than 10 words were negatively coded, and most of those related in some way to the research participant not remembering the exhibit well enough to respond. Table 6 shows that approximately one third of responses were related to place-based or environmental concepts, including feelings of fear, hope, and motivation to take action. Without specific prompting, participants offered words that highlighted the local focus of the exhibit, its environmental lens, or participant feelings towards climate related topics.

Table 6

Words participants used to describe the exhibit (N=419)

Broad Theme	Example Words Used	Frequency
General adjectives, nouns, or short phrases describing the exhibit	"Beautiful," "Fun," "Science," "Good for kids"	65% (n = 274)
Specific adjectives, nouns, or short phrases related to environmental or place-based concepts in the exhibit	"Locally focused," "Anybody can make a difference," "Pollution," "It's not too late"	37% (n=101)
Words indicating the experience felt impactful or significant	"Enlightening," "Powerful," "Important"	16% (n=44)

Thinking, talking about, or connecting the exhibit to everyday life

In addition, participants were asked if they had thought about the exhibit, talked with someone about the exhibit, or connected the exhibit to something in their everyday life in the 4-6 weeks since they had visited. Table 7 shows participants' responses to these questions.

Table 7

Post-Visit thoughts, conversations, or reflections on the exhibit content (N=162)

In the time since your visit, have you…	Yes	No	Unsure
Thought about this exhibit?	58% (n=94)	34% (n=55)	8% (n=12)
Had a conversation with someone about this exhibit?	43% (n=70)	52% (n=83)	5% (n=8)
Noticed or experienced anything in your everyday life that reminded you of this exhibit?	37% (n=59)	45% (n=73)	18% (n=29)

If a participant answered "yes," they were asked in an open-ended form what it was they had thought about, talked about, or noticed. Participants who answered "no" or "unsure" were not asked a follow-up question in this section of the survey.

For participants who had thought about the exhibit (n=94), 47% (n=50) of them said they had either thought about the overall visit experience or about a specific exhibit element—for example, "how much I liked the exhibit design" and "how cool it was to see artists work with scientists," or "the bird paintings" and "I think about that silly seal photo at least once a week."

Of participant responses, 26% (n=28) indicated that they had thought about climate change and human impact on the environment, either in a general sense or in specific relation to their local area as featured in the exhibit. This included responses such as, "The challenge and need to communicate in engaging ways about climate, especially how it impacts right where you live" and "How climate change is affecting this unique area." Some participants even referenced local locations: "As I walk the Padilla Bay Shore trail, I'm happy that the amount of garbage is greatly reduced."

In addition to the local focus of the exhibit, 20% (n=21) of participants said they reflected on their personal relationship with climate change or otherwise connected the exhibit content to their personal life and experiences. One participant said,

> "I just love how it teaches me about PNW specifically and how I can help. It brings the climate issues to my front door instead of telling me the whole world is one fire, making me feel guilty and hopeless."

Other responses in this category included, "I enjoy bird watching so I've thought about the exhibit and recommended it to a friend," and "How I must become better at taking care of our planet by using sustainable and renewable resources."

Finally, 7% of participants gave responses that were coded as "other" since they did not fit within the categories described above. These responses did not directly relate to the content or experience of the exhibit, like "I wish the exhibit would travel," and "I want to go back."

Table 8 shows the kinds of conversations that study participants had about the exhibit in the 4-6 weeks following their experience.

Table 8

Types of conversations visitors had about the exhibit (n=70)

Description	Example Response	Frequency
Connection to personal life or community	"I want to get involved with the cleanup of my local parks and neighborhood."	27% (n=21)
Specific exhibit element	"How the bird exhibit impacted me so much."	23% (n=18)
Overall exhibit experience	"The exhibit itself, what it represented, the interesting representation of science in artistic ways."	21% (n=16)
Climate change and human impact on the environment	"The impact of changes in nature due to climate change on our lives."	16% (n=12)
Local focus or relevance	"How intricate and inclusive the portrayal of the Puget Sound ecosystem."	9% (n=7)
Other	"The price of admission."	4% (n=3)

Table 9 shows what it was that participants noticed or experienced in their everyday lives that had made them think of the exhibit in the 4-6 weeks since their visit. The most prevalent type of response to this question referenced a local location or topic. Connections, either local or personal, made up over half of the responses to this question.

Table 9

What participants noticed or experienced that reminded them of the exhibit (n=59)

Description	Example Response	Frequency
Local locations or topics	"In the time since my visit I have picked up garbage on Whidbey and San Juan Island. It reminds me that small actions can make big changes."	27% (n=20)
Nature in general	"Listening to bird calls, seeing tree stumps and how they can tell us so much."	25% (n=19)

Table 9 (continued)

Environmental impacts	"When I see birds in the wild, I think about the effect global warming might have on them in the near future."	21% (n=16)
Personal connection to topic	"I noticed the possibility of drainage from my property going right into creek nearby and just below my property."	20% (n=15)
Media	"I was watching a show on PBS on orcas and I thought of the exhibit."	7% (n=5)

Research Q2: To what extent does visiting an exhibit dedicated to the local environment impact an individual's relationship to their local area?

When asked, 'What do you think of as your local area?' 70% of participants (n=113) responded with either Western Washington, Oregon, or the Pacific Northwest more broadly. This result reflects that, for the majority of participants, their "local area" was the same area featured in the exhibit they had seen. Additionally, when asked to characterize the place they live, 43% (n=70) of participants responded that they live in a suburban area, 40% (n=64) indicated that they live in an urban area, and 17% (n=28) indicated that they live in a rural area.

Participants were asked to rate 3 statements measuring the impact of the exhibit on their connection to their local area, using a 5-point scale where 1 was not at all and 5 was extremely.

Table 10

Participants' ratings of how the exhibit impacted their sense of place (N=162)

The exhibit…	**Median Rating (1-5)**
Made me feel attached to the environment in my local area	4.00
Impacted the way I feel about my local area	3.00
Made me feel like I have a special connection to my local area and the people who live there	3.00

Participants who indicated the exhibit had little to no impact on their connection to their local area (rating of 1 or 2) were asked to explain why, choosing from a series of 5 multiple-choice answers, as seen in Table 11.

Table 11

Participants reasons for feeling that the exhibit had little to no impact on their sense of place (n=28)

Description	Frequency
Did not spend enough time in the exhibit	36% (n=15)
Already extremely attached or connected to local area	26% (n=11)
Did not learn anything new from the exhibit	12% (n=5)
Not relevant to my local area	10% (n=4)
Would not expect a museum exhibit to do this	7% (n=3)

Participants who indicated that the exhibit had moderate to extreme impact (rating of 3 or higher) on their connection to their local area were also asked to explain why. One of the follow-up questions was an open-ended response asking what about the exhibit made participants feel attached or connected to their local area. One third of participants (37%, n=46) were able to draw either personal or community-based connections to the exhibit, and the familiarity of the content made it feel personally relevant. For example, one participant said:

> "Seeing the diversity of species that live in the area gave me a new perspective and made me realize the sheer magnitude of the Puget Sound ecosystem. I thought about how I share the environment with this ecosystem and it made me appreciate the area much more."

Other responses in this category included those such as, "The work was so local for me that I could not help but feel the connection," "I grew up in Seattle and on Hood Canal. I have seen so many changes to the ecosystem. Salmon used to be plentiful, so were starfish… and sand dollars. Now I see none of those when I go to my place on the beach," and, "I just think the PNW is the best place on earth, and I want to do more to preserve it and protect the plants and animals here."

Another notable theme for participants in feeling attached to the local area was drawing connections to climate action, engagement, and/or broader environmental issues. One quarter of responses (28%, n=34) related to those such as, "I was touched by the stories of everyday

people taking actions that make a difference," "It has inspired me to become more active in habitat restoration in my local Chehalis River floodplain," and,

> "It was partly because I realized that people with such different jobs (e.g., artists, different kinds of scientists, activists, museums, etc) are all feeling impacted by global change, thinking about it, and trying to do something to facilitate change and share in this experience together. It made me realize that other people are concerned about the same things that I am, and that they have different skills to address the problem."

A further 20% (n=24) of responses called out specific exhibit content that increased feelings of attachment, such as "I am in particular paying a LOT more attention to the calls of birds. I loved the room with the portraits and sounds of individual birds." Additionally, 8% (n=10) of participants responded that they already felt strongly attached to their local area or that the exhibit reinforced feelings of attachment, "I already felt attached, it's just nice to have the tangible refresher."

Interestingly, while some respondents contradicted their rating, saying the exhibit did not impact their attachment or connection because they were not from this area (categorized as "other," 3% n=4), several others not from the Puget Sound region (4%, n=5) were able to draw connections between the exhibit topic and their own local area. This included responses like, "I am not from Seattle, but am an ecologist in the desert southwest. It was easy for me to draw direct parallels between the threats in the PNW and my own region."

Research Q3. How do exhibits dedicated to the local environment inspire environmental engagement or stewardship?

Participants were asked to rate two statements measuring the impact of the exhibit on their environmental engagement or stewardship, again using a 5-point scale where 1 was not at all and 5 was extremely (see Table 12).

Table 12

Participants' ratings of the impact of the exhibit on their environmental concern (N=162)

The exhibit made me think that…	Median Rating (1-5)
It is important to protect the natural environment	4.00
The natural environment is threatened by human activities	4.00

Participants who indicated that the exhibit had little to no impact on their environmental engagement or stewardship (rating of 1 or 2) were asked to explain why, selecting from several multiple-choice options presented to them (see Table 13).

Table 13

Participants' reasons for feeling that the exhibit had little to no impact on their environmental concern (n=8)

Description	Frequency
Already extremely concerned about environmental threats	46% (n=5)
Did not spend enough time in the exhibit	36% (n=4)
Did not learn anything new from the exhibit	18% (n=2)

Participants who indicated that the exhibit had a moderate to extreme impact on their environmental engagement or stewardship (rating of 3 or higher) were asked to explain why in an open-ended question. Responses were coded into 6 emergent categories seen in Table 14.

Table 14

Participants' reasons for feeling that the exhibit had a moderate to high impact on their environmental concern (n=121)

Description	Example Response	Frequency
Overall exhibit or specific exhibit element	"I found that the animal photography was particularly impactful."	31% (n=43)
Climate change & human impact on the environment	"Seeing the representation of harm and human-caused change in a physical form really brought the reality home."	29% (n=41)

Table 14 (continued)

Call to action; responsibility or importance	"That we need to do more together. This is our world and home. We need to take care of it more."	11% (n=16)
Local and community connection to conservation	"Stories from community members about their various forms of conservation work."	10% (n=14)
Already felt this way or feelings reinforced	"I already feel like that, it just reminded me that time is running out."	9% (n=12)
Personal or emotional response	"It gave me an emotional connection to the threat and a reality check."	6% (n=9)
Other	"Unsure"	4% (n=5)

Discussion

The purpose of this study was to understand whether and how museums with exhibits dedicated to their local environment can influence people's sense of place attachment in the weeks following their visit. One hundred and sixty-two participants responded to an online questionnaire after visiting one of three museum exhibits dedicated to the local environment. Several key findings emerged from participant responses. The following section discusses these findings, as well as how they confirm larger trends in the literature. Though the findings here reflect several previous research studies, no single prior work exists in the same context or captures the combination of themes that emerged in this study.

Impactful Exhibit Experiences

Almost all participants remembered something about the exhibit four to six weeks after their visit, and over half had thought about the exhibit since their visit. This level of attention speaks to the impact of the exhibit experiences participants were having. The number of responses that related memories of the exhibit to personal experiences, attitudes, beliefs, and values reinforces research that suggests that a majority of participants were more willing to engage with climate change information (Arbuthnott et al., 2014), and more

equipped to address it in their own lives moving forward (Ardoin et al., 2013; Wong-Parodi & Berlin Rubin, 2022).

Beyond the overall exhibit experience, the most memorable parts of a participant's visit were the exhibit's local focus, environmental messaging, or connections to people's personal lives. These findings are consistent with prior research indicating that effective climate change education is not only engaging, but also personally relevant and meaningful (Monroe et al., 2019). Throughout the survey, participants highlighted specific objects or interactive experiences in the exhibit that stood out to them in their memory, suggesting that they were highly engaged during their exhibit visit. Furthermore, beyond terms that related to the overall exhibit experience, the most common words participants used to describe the exhibit related to either the local focus and the environmental messaging of the exhibit, or the impact of the experience. This suggests that a majority of visitors felt the exhibit was personally relevant or meaningful.

Additionally, participants were able to convey the complex ideas they had, the emotions they felt, and the details they recalled about the exhibit even several weeks after they had visited. This level of engagement—including expressions of concern, hope, and knowledge—is consistent with findings from Swim et al. (2017) showing that visitors to nature-based museums reported high levels of psychological, personal, and civic engagement. The findings from this study expand the focus on nature-based museums to include other museums with environmentally focused exhibits.

Finally, results from this study affirm suggestions from the most recent Yale Program on Climate Communication (Fine, 2023) to elicit feelings of community and commonality as well as incorporate science and storytelling to create more holistic environmental experiences. Many participants indicated they had thought and talked about personal and community connections between the exhibit and their own experiences in the weeks following their visit.

Positive Impact on Sense of Place

A key finding from this study is that many participants indicated that the exhibit positively impacted their relationship with their local area. Previous research has shown that student and informal science learning programs, as well as outdoor recreational activities, can positively impact sense of place (Harris et al., 2023; Upham et al., 2018),

but this research demonstrates that museum exhibits can also be included in that category.

This research measured sense of place in the Puget Sound region and took inspiration from place-based research done in the area previously. Findings from this study support prior research suggesting that place attachment is generally high among Puget Sound residents (Trimbach et al., 2022). Furthermore, Poe et al.'s (2016) locally defined conceptual model of place attachment found that strong connection to place can motivate people to engage in restoration and conservation, and this finding is supported by results here that show almost a third of participants felt their attachment to their local area was impacted by drawing a connection between their exhibit visit and climate action or environmental engagement.

When asked why they felt impacted by the exhibit, the majority of participants indicated that they were able to draw personal or community connections to the exhibit, and that seeing familiar places and topics made the exhibit feel personally relevant. In a developmental study from Upham et al. (2018), community involvement and environmental concern were seen as some of the key dimensions of place attachment.

Environmental Concerns through a Local Lens

"Place attachment alone is not the sole pathway to stewardship" (Trimbach et al., 2022, p. 61). An overwhelming majority of participants indicated that the exhibit made them feel strongly about the importance of protecting the natural environment, as well as concerned about the threat of human activities. These results support prior findings indicating that visitors to natural history museums are likely to be open to receiving information about environmental issues as well as reflecting on personal and collective action (Arbuthnott et al., 2014).

In previous research done on the concept of psychological distance (Chu & Yang, 2020, van der Linden et al., 2015) it has been shown that making climate change feel more present, urgent, and relevant makes people feel more willing and able to engage in climate action. When asked why the exhibit impacted feelings of environmental engagement, the majority of participants pointed to specific exhibit elements as well as the experience of witnessing climate change or human impacts on the environment in a space made physical. This substantiates previous research that promotes museums as being ideal spaces for visitors to

explore the complex nature of climate change – to connect the abstract to the concrete and the local to the global (McGhie et al., 2020).

Additionally, it has long been a struggle for climate change communicators to balance conveying the urgent necessity of immediate climate action without inciting feelings of hopelessness or despair (Chu & Yang, 2020). Findings throughout survey responses in this research indicate that seeing examples either of local individuals involved in climate action or impacts of climate change on local communities can be both inspiring and motivating forces for museum visitors to intend to take action themselves. This greater sense of agency and efficacy in environmental engagement can lead to more hopeful feelings towards the climate crisis, and this, too, was reflected in a number of participant responses regarding what was most memorable or impactful about the exhibits. Exhibits demonstrating both local crises and local solutions can make people feel more motivated to get involved in their communities as well as hopeful about possible outcomes regarding environmental engagement.

Environmental communication is multidimensional, and the combination of reducing psychological distance by harnessing sense of place as well as implementing impactful engagement strategies in exhibit design choice has indicated that it is worthwhile for exhibits to focus on environmental concerns, and that visitors care deeply about these topics.

Limitations

There are several limitations to the outcomes of this study. First and foremost, this research primarily presents a Western discussion and understanding of environmental conservation and land stewardship, operating under the presumption that most people approach their relationship to the environment from an individualistic rather than communal standpoint, and likely conceptualize themselves as being separate from rather than integrated with the environment. Approaching the study using non-Western and/or Indigenous ways of knowing and understanding land use, ownership, and stewardship would likely present different findings.

Secondly, the positionality of the principal researcher as a young, white, cisgender woman should also be taken into consideration regarding the motivation of participants to say yes to the initial request for participation and the further motivation to respond to and complete the email survey. Individuals that share one or more of these identities

with the principal researcher may have felt more comfortable being approached and saying yes to participate.

Finally, it is possible that the individuals who visited the featured exhibits and elected to participate in the study are those who are already strongly connected to their local area and/or already feel a strong sense of environmental engagement, which could have impacted the degree of the exhibits' influence in the results.

Implications

Museums have been deeply involved in the climate conversation for several decades, recognizing the urgent importance of climate change education and mitigation in our communities. However, strategies to engage visitors on the topic of climate change can always be honed and refined. Up until now, place attachment as a tool for environmental engagement has largely been unexplored in museum settings, but the current study suggests potential further areas of study as well as practical implications for the field on the topic of place attachment in museums.

Implications for Future Research

This study was just a first step in research on museums and place attachment; there is much room for further inquiry. First, this study was completed 4-6 weeks after a participant's exhibit visit. A potential area of future study could be to follow-up with participants several months to a year after their exhibit visit to gain insight into the longer-term impacts of some of the climate communication strategies previously discussed in this article. Another study could compare a research participant's level of place attachment both before and after a visit to an exhibit featuring the local environment. This would allow researchers to measure change in level of place attachment as directly related to the exhibit visit. Finally, a future study could measure place attachment in exhibits with respect to pro-environmental behavior. This research adapted a framework from Upham et al. (2018) to survey levels of community involvement and environmental concern as dimensions of place attachment, but a future study could implement the rest of that framework to include research on exhibit impact on environmental norms, efficacy, and pro-environmental behavior as dimensions of sense of place.

Implications for Practitioners

First, this research has highlighted that best practice in effective climate communication – making exhibits engaging, personally relevant, and meaningful – does work. Practitioners should keep this in mind when addressing climate change and/or environmental topics in exhibits and programming. Framing environmental threats with respect to a community's local area is an effective way to garner attention and impactful visitor outcomes. Visitors to these exhibits care about environmental issues – both in a general and a local sense.

Second, this research has demonstrated that an institution does not have to be nature-based in order to address environmental topics. Art museums are just as equipped to present exhibits about the environment of their local area, and those exhibits do have meaningful impact on visitors. This could more than likely be expanded to other types of non-nature-based museums, as well.

Finally, it is important to strike a balance between the urgency of action and the necessity of hope when empowering individual motivation towards environmental engagement. Demonstrating human impact on the environment and having a specific call to action in exhibits can make visitors think about their own impact on the environment as well as their ability to get involved in environmental restoration in their communities. However, presenting the climate crisis without room for hope can lead to the feeling that it's too late. Acknowledging the threat that we face from climate change is essential, but we also must recognize that we, together, can make a difference in our communities and in our environments. This is our home, and museums have a role to play in making it better.

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Appendix A

Questionnaire

Distributed via Jotform

1. Recently, you visited *x museum* [specified to particular museum]. Including that visit, how many times have you been to this museum in the past 5 years?

2. Are you currently a member of this museum?

3. During your visit, you saw *x exhibit* [specified to particular exhibit]. What do you remember most about this exhibit?

4. What three words or short phrases would you use to describe this exhibit to someone who hasn't seen it?

5. In the time since you visited this museum, have you thought about this exhibit?

    a. If yes, what have you thought about?

6. In the time since you visited this museum, have you had a conversation with someone about this exhibit?

    a. If yes, what have you talked about?

7. In the time since you visited this museum, have you noticed or experienced anything in your everyday life that reminded you of this exhibit?

    a. What was it you noticed/experienced, and what in the exhibit did it remind you of?

Please rate the following questions based on your feelings since you visited this museum

8. The exhibit impacted the way I feel about my local area

1 - 2 - 3 - 4 - 5

(No impact) (Extremely impactful)

9. The exhibit made me feel attached to the environment in my local area

1 - 2 - 3 - 4 - 5

(Not at all attached) (Extremely attached)

10. The exhibit made me feel like I have a special connection to my local area and the people who live there

1 - 2 - 3 - 4 - 5

(Not at all connected) (Extremely connected)

11. The exhibit made me think that it is important to protect the natural environment

1 - 2 - 3 - 4 - 5

(Not at all important) (Extremely important)

12. The exhibit made me think that the natural environment is threatened by human activities

1 - 2 - 3 - 4 - 5

(Not at all threatened) (Extremely threatened)

13.a. [If rated questions 9 and 10 a 3 or higher] Your ratings suggest that the exhibit made you feel attached or connected to your local area. What about the exhibit gave you this feeling?

13.b. [If rated questions 9 and 10 a 2 or lower] Your ratings suggest that the exhibit did not make you feel attached or connected to your local area. Why do you think that is? Check all that apply.

- I would not expect a museum exhibit to do this
- The exhibit was not relevant to my local area
- I am already extremely attached or connected to my local area
- I did not spend enough time in the exhibit
- I did not learn anything new from the exhibit

- Other

14.a. [If rated questions 11 and 12 a 3 or higher] Your ratings suggest that the exhibit made you feel like the environment needs to be protected or that it is currently threatened. What about the exhibit gave you this feeling?

14.b. [If rated questions 11 and 12 a 2 or lower] Your ratings suggest that the exhibit did not make you feel attached or connected to your local area. Why do you think that is? Check all that apply.

- I would not expect a museum exhibit to do this
- The exhibit was not relevant to my local area
- I am already extremely attached or connected to my local area
- I did not spend enough time in the exhibit
- I did not learn anything new from the exhibit
- Other

15. What do you think of as your local area?

16.a. [If rated question 8 a 3 or higher] Your ratings suggest that the exhibit impacted the way you feel about your local area. In what ways did it do that? Check all that apply

- It made me think of my favorite activities in my local area
- It made me think of my community in my local area
- It made me think of the beauty of the natural environment in my local area
- It made me think of my culture or heritage in connection to my local area
- Other

16.b. [If rated question 8 a 2 or lower] Your ratings suggest that the exhibit did not impact the way you feel about your local area. Should it have? Why or why not?

17. What year were you born?

18. Which of these options best describes your gender identity? Check all that apply.

- Woman
- Man
- Non-Binary
- Transgender
- Other

19. Which of these options best describes your race/ethnicity? Check all that apply.

- African/African American/Black
- Indigenous American/Native American/American Indian
- Asian/Asian-American
- Latinx/Latina/Latino/Hispanic/Chicano
- Middle Eastern/Arab/Arab American
- Native Hawaiian/Pacific Islander
- White/Caucasian
- Other

20. What state do you live in?

21. If you do not live in the US, where do you live?

22. How would you characterize where you live?

- Urban
- Suburban
- Rural
- Other