FUTUREWATERS | AGUASFUTURAS: INVESTIGATING SALIENCE AS A FRAMEWORK FOR UNDERSTANDING PUBLIC ART AS A TOOL IN SEA LEVEL RISE COMMUNICATION

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ABSTRACT
The necessary infrastructural and societal changes required to address the flood risks associated with sea level rise in urban areas are vast. In order to promote equitable resilience, public understanding and engagement with issues of sea level rise is imperative. While there is a growing body of knowledge related to sea level rise communication, research that specifically addresses public art’s role in this function remains scarce. In this article, we describe a pilot research project aimed at building understanding of how public art installations may contribute to engagement with local issues of sea level rise.

The research focuses on FutureWATERS/AGUASFuturas, an art installation exhibited in 2018 on the East Boston Greenway in East Boston, MA. Quantitative and qualitative data were gathered using paper and online surveys (n=114) and interviews (n=5). Descriptive statistics were calculated from the quantitative survey data; qualitative data were analyzed using an inductive approach (Vaismoradi & Snelgrove, 2019). Emergent themes in the qualitative data were found to correlate with the three themes of the Salience framework: cognizance (knowledge), attentiveness and salience (Baum, 2003; McDonald, 2009).

Salience is described as the building of purposeful engagement with a topic, and the final step in a process that evolves from initial cognizance (awareness) and sustained attentiveness (finding interest or excitement) (Baum, 2003; McDonald, 2009). This study pointed to the value of art in increasing knowledge even among those educated in the subject, as well as art’s ability to foster attentiveness through its aesthetic and kinesthetic experiences. While more refined and longer-term studies are needed, this research points to the value of using salience as a framework to contextualize and evaluate how public art installations may contribute to sea level rise communication and public engagement efforts.

Keywords
Public art, climate change communication, social science research methods
1 INTRODUCTION

The effects of sea level rise—flooding, disturbance to coastal ecosystems and disruption of critical infrastructure—are expected to impact 2.4 billion people (40% of the world population) living in coastal areas (Pal et al., 2023). In the U.S., as many as 13.1 million people will be impacted by 2100 if no adaptive measures are set in place (Hauer, 2016). The necessary infrastructural changes required to address the flood risks associated with sea level rise in urban areas are vast. In order to gain the necessary local public support for the implementation of climate adaptation policies, effective communication and public engagement is needed (Akerlof et al., 2017; Cain et al., 2020; Drews & van den Bergh, 2016). While there is a growing body of knowledge about the impact on public perception and engagement on sea level rise communication strategies that use imagery, graphics, and digital visualization tools (Covi et al, 2016; Decock-Caspell et al, 2021; Shaw et al 2009; Stephens et al, 2015; Wang et al, 2018), few studies have critically assessed the role that public art may play in contributing to public engagement with this pressing issue.

Because public art presents a unique set of opportunities related to SLR communication, it was important to explore a framework that could best help evaluate its effectiveness. Early analysis of the data in this pilot research led to salience as a framework to study factors by which public art can be evaluated in affecting public engagement (Baum, 2003; McDonald, 2009). Salience describes a more intense interaction with a phenomenon associated with a sense of urgency or purpose. Reaching salience requires processes that raise cognizance (awareness) and attentiveness (finding interest or excitement) to a phenomenon or issue. This framework recognizes the simultaneous need for cognitive and affective engagement in order to affect behavior change (Lorenzoni et al., 2007), as well as the need to make information accessible and relevant as part of a multi-layered approach to increase public understanding, sustain attention, and spur action (Cash et al, 2003).

1.1 Sea level rise communication

Public understanding of SLR specifically is challenged by the complex nature of the problem and the difficulty of engaging with traditional, frequently abstract, forms of scientific communication (Nocke et al. 2008). Additionally, there is conflict between the specificity required by planners and engineers, and the type of information delivery which can be connected to personal context, thus failing to engage the general public (Akerlof et al., 2017; Lindeman et al., 2015). However, while better scientific understanding may not directly affect risk perception (Leiserowitz, 2005), addressing cognizance continues to be a critical first step towards creating salience with a topic (McDonald, 2009).

Furthermore, the implications of climate change may not always be clear for the individual. The variability of the information, due to constant refinement of projections based on changing or uncertain factors such as emission levels (Church et. al, 2013), may cause confusion. The difficulty in understanding projections presented in technical and scientific detail (Covi & Kain, 2016), and the future orientation of the information, such as projections for 2100 may result in ambivalence (Fincher et al., 2014).

The frame and style of how information is presented has the potential to positively impact public understanding of SLR. Avoiding technical language, using priming through increased exposure, and providing multiple modalities for learning and understanding — such as experiential and kinesthetic experiences that localize the information — could help audiences better connect with the topic (McDonald, 2009; Gardner, 1993; Dunn, 1993; Aragón et al, 2019). While climate change information is often presented through visualizations such as tables, charts, maps, etc. (Nocke et al, 2008), this information delivery mode may not effectively support public understanding. Kain and Covi (2013) have shown that people have difficulty interpreting graphs, maps, and photographs, with graphs being the most difficult, followed by maps; photographs were most easily understood as they do not require the same level of interpretation demanded of graphs and maps. Current work involving interactive digital visualizations that provide personal interaction with large data sets through scalable and customizable 3D simulation environments have provided a valuable tool for increasing understanding (Neset et al 2016; Sheppard et al 2011, Dulic, Angel, & Sheppard, 2016). However, these visualizations are detached from the experience of physical place and may not be accessible to all publics (Aragón, et al., 2019).
1.2 Art in climate change communication

For several decades, artists have addressed climate change through works that have been loosely categorized as representations or data visualizations, performance environments that create immersive experiences, and interventions, which are designed to change behavior (Giannachi, 2012). Public art installations fall within the category of representation, translating scientific information into visualizations of future scenarios that have the potential to be physically, emotionally, and intellectually more accessible to the public (Aragón, et al., 2019). While they may not be able to overcome some of the aforementioned challenges of SLR communication, such as variability of the information, they offer an alternative to digital models and virtual visualizations which can be experienced in public space by a diverse audience (Aragón, et al., 2019).

Public art installations have the capacity to simplify the message, localize the information, and provide alternative ways of learning through kinesthetic and sensory experiences (Bonnemaison & Eisenbach, 2009). These experiences, as well as art’s capacity to elicit visceral responses and create personal experiences through metaphors, analogies, and narratives, have the potential to increase attentiveness as a preamble to salience (Roosen, et al., 2018; Thomsen, 2015). Additionally, like data sculptures, art installations are capable of harnessing human’s inherent ability to process information through physical objects, as opposed to just images, in ways that are intuitive and memorable (Zhao et al, 2008).

While there is a growing body of literature in support of the use of art in addressing common challenges of climate change communication (Galafassi, et al., 2018), studies using social science methods to assess the impacts of art in engaging the public with climate change have been limited (Burke et al., 2017). Although it could be argued that social science methodologies may not be able to fully capture the “multidimensional and multifaceted” effects of art (Galafassi, et al., 2018), they can offer insight. This pilot project used social science research methods to explore the research question: can public art installations contribute to increased knowledge, awareness, and salience related to SLR induced flooding? If so, how?

2 RESEARCH OBJECTIVES

The research sought to expand our knowledge of the impact of public art installations as a tool for communicating with the general public about the effects of sea level rise. The study tested the salience framework to measure how the art installation, FutureWATERS | AguasFUTURAS (Fig. 1), may have contributed to increased public engagement with local issues of sea level rise (Baum (2003); McDonald, 2009). To achieve this, results were evaluated on whether or how they contributed to increased cognizance, attentiveness, and salience.
3 MATERIALS & METHODS

3.1 Materials: *FutureWATERS|AguasFUTURAS* art installation

*FutureWATERS|AGUASfuturas* (2018) was a temporary art installation (November - December 2018) exhibited along the East Boston Greenway (Fig. 1 & 2). This public greenway, located in an environmental justice community, was chosen because it is also one of the most vulnerable areas for coastal flooding in Boston, MA (Fig. 3). The artwork was developed in collaboration with local community groups, the Friends of the East Boston Greenway, and the Boston Society of Landscape Architects, who helped disseminate the artwork.

Designed to evoke the water’s surface, the installation consisted of aluminum frames containing wire mesh panels at different heights to indicate the projected 1% chance flood levels for 2030 (2.2 ft) and 2070 (5.4 ft.). The panels contained spheres painted with thermochromic pigments (color-changing in relationship to temperature), reflective iridescent sequins, blue ribbon, and motion-activated solar lighting. These materials created a visually dynamic and interactive surface meant to engage park users during the day and night (Fig. 1).

The artist used site-specific sea level projection data and projected average high temperatures for the associated target years. This information was represented through the height of the mesh panels and through the thermochromic pigments in the acrylic spheres, calibrated to change color when temperatures reached the projected high temperatures. Additionally, the installation was accompanied by a bilingual sign (English and Spanish) with text and diagrams explaining the concept of the artwork and its associated message about climate change impacts (Fig. 4).
Figure 2. Carolina Aragón, FutureWATERS/AGUASFuturas installation on the East Boston Greenway, (2018).

Figure 3. FutureWATERS location on the East Boston Greenway, showing projected flood depths for 1% Chance of Flood in 2070.
Figure 4. Excerpt from the signage. Diagram showing how the FutureWATERS/AGUASfuturas installation visualized flooding and temperature changes.

3.2 Methods

The researchers were interested in understanding how the FutureWATERS installation contributed to public knowledge and understanding of local flooding resulting from projected sea level rise. The study employed mixed methods to explore the participants' perception of their knowledge and understanding about site-specific sea level rise. One of the researchers, who is also an active local community member, organized the administration of the surveys and interviews. Survey questions were adapted from previously validated questionnaires and were translated into Spanish, the second most common language spoken in this community. Online surveys were publicized via social media, email lists, flyers, and at neighborhood meetings and administered using Qualtrics XM. Paper surveys, designed for ease of completion and accessibility, were completed at six community meetings. Some of the questions consisted of statements (e.g. Nothing I do makes a difference to climate change one way or another) that the participants rated on a scale ranging from “Strongly Agree”, “Agree”, “Neither Agree/Nor Disagree”, “Disagree”, “Strongly Disagree”, “Not sure”. There were 2 open-ended questions in which participants were asked about their impressions of climate change art installations in general, and about FutureWaters in particular.

Survey respondents were asked if they would like to participate in interviews. Those who were interested provided their contact information for follow up. Surveying was conducted between November 2018 and May 2019. Interviews were conducted both in person (n=2) and via Zoom (n=3) from June through August 2019. Overall, 114 participants completed the surveys (59 online and 55 on paper) and 5 community members participated in interviews. Nearly 30% of participants had seen the art installation.

The five interviews were all facilitated by the same person with the two other authors present to observe and take notes. Of the 5 interviewees, three people had interacted with the installation. The two interviewees who had not seen the installation were shown a brief video of the FutureWATERS at the beginning of the interview. Two interviews took place face to face at neighborhood community buildings and three were conducted via Zoom video-conference. Interview questions asked participants to describe their experiences seeing the installation including what first caught their attention. Participants were asked about their previous knowledge of flooding potentials on the greenway, whether seeing the installation had an impact on how they thought or felt about projected flooding, and if interacting with the installation might impact their involvement in community climate change planning efforts.

The survey and interview questions sought to understand participants’ attitudes, knowledge, and perceptions of local climate change-related flooding; awareness of community planning efforts related to climate change and flooding in East Boston; exposure to and impressions of the FutureWATERS installation; and demographic information. Descriptive statistics, including crosstabs, were calculated from the quantitative survey data. Interviews were taped and transcribed, and, along with the qualitative survey question responses were then analyzed using an inductive descriptive approach to identify patterns. (Creswell, 2017; Vaismoradi & Snelgrove, 2019). During the process of data analysis, the researchers
discovered that the patterns of responses generally coalesced into the three themes of the Salience framework.

4 RESULTS

The results of the study are presented using the conceptual framework of cognizance, attentiveness, and salience for climate change communication (Baum, 2003; McDonald, 2009). Key findings suggest that the installation contributed to **cognizance** through increased accuracy of knowledge; increased **attentiveness** as a result of the aesthetic qualities of the artwork; and a path towards salience through visceral and emotional experience of the artwork.

4.1 Cognizance

For this study, we measured cognizance in terms of knowledge related to future flood elevations. Overall, the surveys show that people who saw the installation reported more accurate knowledge on this topic than those who did not see the installation. However, it may be that this particular group was already more knowledgeable and engaged with local SLR issues than those who did not see the artwork, reflecting self-selection bias (Shadish et. al.2002). Nevertheless, even amongst those with knowledge of the Climate Ready Boston (CRB) report, which we used as a proxy for previous knowledge and engagement, those who saw the installation reported higher accuracy of knowledge (Table 1) compared to those who did not see the installation.

<table>
<thead>
<tr>
<th>Type of Knowledge</th>
<th>Saw installation</th>
<th>Did not see installation</th>
</tr>
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<tbody>
<tr>
<td>Projected flood levels for the Greenway for the year 2030</td>
<td>52% accurate</td>
<td>28% accurate</td>
</tr>
<tr>
<td>Projected flood levels for the Greenway for the year 2070</td>
<td>78% accurate</td>
<td>39% accurate</td>
</tr>
<tr>
<td>Projected flood levels for the Greenway for the year 2030 among participants knowledgeable of the CRB report</td>
<td>55% accurate</td>
<td>43% accurate</td>
</tr>
<tr>
<td>Projected flood levels for the Greenway for the year 2070 among participants knowledgeable of the CRB report</td>
<td>91% accurate</td>
<td>71% accurate</td>
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</tbody>
</table>

4.2 Attentiveness

Attentiveness was evaluated in the ways that the artwork evoked kinesthetic, intellectual, or emotional responses. Did the visual qualities of the artwork cause participants to notice and/or interact with it? Did the installation evoke attention to SLR induced flooding? Finally, beyond noticing, did experiencing the artwork elicit sensory and emotional responses, and if so, what kinds of associations arose?

Despite the high level of knowledge among some study participants, encountering messaging about the impacts of SLR through a site-specific art project was a new experience for more than half of the respondents. When passing the installation, 61% reported stopping for a couple of minutes or staying for a while, 48% read the signage, 35% report touching the artwork, and 19% report playing with the motion sensor-activated lighting. When asked how they would describe the **FutureWATERS/AGUASfuturas** art installation in just a few words, there were three patterns in the responses: the aesthetic qualities of the artwork; relevance for climate change communication; and the installation’s intriguing nature (Table 2).
Table 2: Sample descriptors

<table>
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<tr>
<th>Response Domains</th>
<th>Frequency mentioned</th>
<th>Sample descriptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic qualities of the artwork</td>
<td>45%</td>
<td>Colorful; fun; eye-catching; abstract, powerful; stark; beautiful</td>
</tr>
<tr>
<td>Relevance for climate change communication</td>
<td>30%</td>
<td>Climate conversation starter; unique and educational; beautiful visualization of water level prediction; impactful installation</td>
</tr>
<tr>
<td>Installation’s intriguing nature</td>
<td>25%</td>
<td>Strange; provocative; unusual; engaging</td>
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The interviews with local residents provided further insights into how people experienced the artwork and how it may have engaged with the affective and/or bodily ways of knowing about flood risk. Two specific themes emerged from the interviews about the framing and style in which the SLR information was presented. First, the attractive and playful qualities of the installation engaged people to investigate the serious subject underlying the installation.

“What you’re doing is taking a nice attractive piece of art, calling attention to it and bringing a serious matter of … something that is a very serious subject that people should know more about.”

Second, the installation provided a compelling and intuitive physical representation of flooding levels.

“[It] helps me to process the likelihood or the potential impacts of something which I cognitively understand is possible, so seeing it is helpful.”

“I was aware, in a different (kind) of awareness -not intellectual- in your gut kind of awareness.”

4.3 Salience

Overall, respondents who saw the installation reported that the novelty and messaging of the installation made future flooding seem real in a way that was impactful and different from standard climate science communication.

“If you actually experience it, it’s really going to put it into place because it is showing those heights. It’s showing that it’s very high. And immediately my first thought is, what can I do about this?”

These comments and others suggest that art can provide an avenue for direct emotional narratives and communication about climate resilience, which can increase salience and offer a path towards greater public engagement.

5 DISCUSSION

This pilot study suggests that artistic visualizations, like the FutureWATERS installation, may have potential to increase the salience of sea level rise communication by providing alternative methods for increasing cognizance and generating or sustaining attention on the subject. By providing a public and localized physical representation of future flooding that simplified the message, the artwork made the information more accessible to the public. Additionally, the physical and embodied experience of the artwork may be associated with the “bump” in knowledge accuracy related to the height of the projected flood levels. This knowledge bump was particularly notable for SLR flooding impacts in the more distant future even among highly knowledgeable residents. This suggests that the experience of physically seeing the representation in three-dimensional form in a familiar and regularly used space may have positively contributed to knowledge. In terms of attentiveness, the aesthetic and experiential qualities — inviting people to stop, look, touch, and read the signage — were perceived as a novel, non-threatening way to learn about the effects of climate change.
Using social science research methods to assess the impact of a temporary public landscape installation as a form of SLR communication can be challenging. The rapid construction and temporary nature of the installation limited options related to research design and results. Future research could benefit from including comparing alternative communication methods with randomized assignment to various treatments, such as printed text, versus messages embedded in lived experience, as was the case in FutureWATERS/AGUASFuturas. Other areas for future research include a pre and post evaluation of the impact of the artwork, longer term assessment to better understand the relationship between salience and activating public engagement in climate change related planning processes, and whether public art may contribute to engage underserved populations with this subject.

Despite the challenges mentioned above, this study affirms public art’s potential in increasing the salience on local issues of SLR induced flooding. This information can be valuable to governmental organizations interested in public engagement with climate adaptation projects, as well as art and landscape practitioners, who may have the opportunity to contribute to this effort through similar art visualization projects in public landscapes and spaces. Best practices in this form of communication include: the importance of a simplified translation of site-specific flood scenarios; the value of an engaging aesthetic which can present the information in a non-threatening way; as well as the value in the artwork’s ability to elicit a wide range of feelings — playful, joyful, attractive, along with serious, concern, curious, and/or scared — as it allows for greater and more sustained engagement with the piece.

6 CONCLUSION

The converging domains of art, research and communication create novel and generative environments to conceptualize and promote climate resiliency. If we are to adapt to the impacts of sea level rise, efforts in sea level rise communication must address the need for public engagement in ways that resonate with diverse audiences. This study points to the value of art installations as a tool for increasing salience on issues of sea level rise by providing a non-threatening point of entry to necessary and unbiased information. Public art has the potential to increase knowledge about local risk through simplified and embodied experiences. By engendering a variety of emotional responses to connect with the subject, public art installations provide a useful extension to other forms of science communication to ensure the whole public can understand potential personal impacts and develop the urgency needed to engage in climate change planning processes. Finally, the study also provides the impetus to think critically about the methods and processes researchers can use to assess the efficacy of art as a tool for climate change messaging. At a time when large populations are at risk of high impact due to the effects of climate change, it is critical to better understand how public art in the landscape can contribute to equitable and just resiliency efforts.

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