CREATING A CULTURAL PROGRAM FOR TSUNAMI

EDUCATION AND WAYFINDING IN SEASIDE, OREGON

by

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A THESIS

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In recent years, rising sea levels due to climate change continue to increase the potential damage of natural disasters such as tsunamis, and the looming threat of a Cascadia Subduction Zone earthquake and resulting tsunami threatens the Oregon Coast. Mitigation and evacuation plans need to be more visible and well-known to people to reduce fear of the unknown, increase the ability for people to make informed decisions in the case of a disaster, and encourage people to find out and prepare more on their own and participate in disaster mitigation and preparation. This research develops two frameworks, a needs and an evaluation framework, that use a community-centric approach to design and create tsunami-related installations and programming that supplement existing tsunami wayfinding methods in Seaside, Oregon. Additionally, by emphasizing community involvement in the *process* of creating public art, the cultural program can strengthen community ties, bring attention to tsunami risk and evacuation, and create a product that meets the needs of the community.

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Introduction

Oregon faces an increasingly severe risk of a catastrophic tsunami due to climate change-induced rising sea levels and the looming threat of a Cascadia Subduction Zone rupture. Luckily, tsunami risk is something that is fairly predictable and there are plans in place to prepare and react to a tsunami. These plans are generally based on encouraging people within the hazard zone to self-evacuate. It is imperative that people know when and how to evacuate and are able to follow wayfinding signage to safety since tsunami-related death on the Oregon Coast is most likely to occur due to people who get confused or lost and are unable to properly follow tsunami evacuation plans (Neis et al., 2014). Therefore, accessible and effective education and wayfinding regarding tsunamis and evacuation is vital to minimizing casualties. Current signage and road symbols are important efforts to help people follow tsunami evacuation plans and limit causalities; however, there is room for improvement. My research explores how public art could make tsunami education and wayfinding more visible, thereby making it more likely to draw interest and increase the chances of people responding to a tsunami event properly.

In particular, this research focuses on how to create a cultural program that uses community involvement to create public art that reflects the local community and addresses their needs. This program aims to strengthen the sense of place and connection within the community and also strengthen their understanding of the risk they face and what plans and actions are being taken to mitigate that risk. By doing so, the program also aims to open a constructive dialogue about potential disasters in a way that reduces fear of the unknown, inspires people to do more research and preparation regarding tsunamis, and encourages people to participate in disaster preparation and mitigation.

Public art is an uncommon medium for tsunami wayfinding, and it offers an untapped

potential to communicate the issue of risk and incite constructive discourse in a more effective

and approachable way than current wayfinding methods. Public art tends to draw people in; it is

a valuable tool for increasing the visibility of these issues which can be especially important in

coastal communities where there is a high tsunami risk and a large transient or visiting

population. Public art is valuable not just as a final product, but as a process as well. The process

of using community feedback and supplementing the local sense of place can bring more

attention to tsunami risk and evacuation and create a more resilient community.

This paper uses Seaside, Oregon (OR) as a case study for the creation of a cultural

program supplementing existing tsunami educational wayfinding. Seaside is a moderately-sized

coastal community along the northern Oregon Coast. Seaside's low elevation means that in the

case of a tsunami impacting the Oregon Coast, the city would be at relatively high risk of near

devastation. Its urban area is divided by an abundance of creeks and rivers that would complicate

an evacuation from the city by limiting the available evacuation routes. Due to it being typical of

many communities along the Oregon Coast and of considerable interest for mapping, Seaside is

already the subject of several studies by many federal organizations, including the U.S. National

Oceanic and Atmospheric Administration (NOAA), the U.S. Geological Survey (USGS), and the

U.S. Federal Emergency Management Agency (FEMA) (Tsunami Pilot Study Working Group,

2006).

The paper is organized into three sections: literature review, existing conditions in

Seaside, and creating a cultural program for Seaside. The literature review consists of four

topics: (1) tsunamis, tsunami risk, and evacuation; (2) wayfinding; (3) public art for tsunamis and

wayfinding; and (4) cultural programming. The existing conditions section outlines the tsunami

risk of Seaside and the current preparation to deal with that risk, including the current methods of tsunami education and wayfinding. Finally, the last section on how to create a cultural program for Seaside is split into two sections: establishing the needs framework and establishing the evaluation framework.

Methodology

This paper is grounded in document analysis pertaining to tsunami mitigation and wayfinding techniques in Oregon and the City of Seaside. These documents are integrated with literature reviews on conceptualizing and designing cultural programming and public art as a tool for education, communication, and wayfinding, and a design process where I create a framework through which one could make a program that uses public art as a tool for aiding tsunami education and wayfinding in Seaside, OR.

The paper consists of three sections: a literature review, an assessment of the existing condition of Seaside, and how to create a cultural program for Seaside. The sources used in the literature reviews consist of peer-reviewed articles from journals and government agency reports and research. The sources used to determine the existing conditions in Seaside are government articles about Seaside, the city's website, and a personal interview with Anne McBride, the Emergency Preparedness Coordinator of the City of Seaside. The information found in the first two sections—the literature reviews and the case study—inform the third section on how to create a cultural program for Seaside.

Part 1) Tsunamis and Cultural Programming: A Literature Review

This part consists of four separate but connected literature reviews: tsunamis and tsunami risk, wayfinding, public art for education and wayfinding, and cultural programming. First, in the tsunami and tsunami risk section, I conduct an analysis of tsunamis and tsunami risk as well as how scientists map and monitor tsunamis. Using government reports and websites, I define key terms such as tsunamis, tsunami risk, and inundation zones and review the current preparation and process for tsunami evacuation. Second, the mitigating casualties is split into three parts: education, wayfinding, and applying wayfinding to tsunami evacuation and education. In the

education section, I use government reports and scientific articles to define important focus areas for tsunami education with an emphasis on what would allow people to evacuate faster and more effectively. In the wayfinding section, I use scholarly articles and publications to define and operationalize wayfinding. With that established, I then review government articles to analyze current tsunami wayfinding guidance. Then, in the application section, I use my research on focus areas for tsunami education and the benefits and aspects of wayfinding and current tsunami wayfinding practices to determine four objectives for a public art program that aims at supplementing tsunami education and wayfinding. Third, in the public art for education and wayfinding section, I use peer-reviewed articles to define public art and determine its benefits, particularly regarding education and wayfinding. Fourth, and finally, in the cultural programming section, I use Carpenter and Blandy's (2008) foundational text on art and cultural programming, *Arts and Cultural Programming: A Leisure Perspective*, to define cultural programming and the process by which a cultural program is made and then adapt that process to suit this research paper.

Part 2) Existing Conditions in Seaside, Oregon

In this part, I use governmental articles as well as a personal interview with Seaside's Emergency Preparedness Coordinator to analyze the existing conditions of tsunami risk, preparation, resources, and evacuation methods. Through establishing the existing conditions, I identify community needs and resources that then inform Part 3.

Part 3) How to Create a Cultural Program for Seaside, Oregon

In this part, I use my research from Parts 1 and 2 to develop a *needs and evaluation framework* which together would allow a programmer to create a cultural program for Seaside. Both frameworks are adapted from Carpenter and Blandy's text on cultural programming (2008)

and utilize details from Part 2 to create theoretical programs meant to inspire a programmer and illustrate what a program could look like. The needs framework is adapted from Carpenter and Blandy's process to create a cultural program. The evaluation framework is inspired by Henderson's chapter about program evaluation and utilizes the four objectives determined in the end of the mitigating casualties section of the literature review plus a fifth objective derived from the cultural programming section. Both frameworks are based on wayfinding and public art as defined by their respective literature review sections.

Part 1: Tsunami and Cultural Programming: A Literature Review

Tsunamis and Tsunami Risk

Tsunamis are giant waves created by large earthquakes, volcanic eruptions, or landslides that occur in or near the ocean and cause large amounts of water to be displaced (USGS, n.d.-b). They are not tidal waves, because they have nothing to do with the tides, and unlike wind-generated waves, they generally do not curl or "break." Instead, they act like a fast-moving tide which can reach much farther inland than normal. The height and speed of a tsunami is dependent on the depth of the ocean. At greater depths, the wave height will not be as significant, though it can move very fast, while at shallower depths, the wave will slow and grow taller (DOC & NOAA, n.d.).

Tsunami risk, or the statistical risk that a certain area could be impacted by a tsunami, is something that is fairly predictable, so there are often plans in place which may not change as frequently or significantly as plans for other disaster types. Since tsunami risk is largely dependent on elevation and other geographical conditions, scientists can analyze a given region and determine which areas would be impacted by a tsunami and create inundation maps (Neis et al., 2014). Therefore, an inundation map shows how high the water would reach at certain levels of inundation (this predicted impact area is also referred to as the "hazard zone"). Inundation maps generally show the impact of various flood stages (or levels of flooding) such as a flood stage of 5 feet, 10 feet, and 15 feet (USGS, n.d.-a). While tsunamis are not the only cases of significant flooding or the only disaster an inundation map can predict for, inundation maps are vital for preparing for tsunamis. Understanding which areas could be impacted by rising water levels, and how severely those areas could be impacted, is paramount to knowing which areas to

evacuate, choosing correct paths and areas for evacuation, knowing what resources could be impacted, estimating damage, and other vital information.

Tsunami inundation maps often show potential damage for different scenarios such as distant-source and near-source tsunamis, and there damage scenarios are based on how great the distance is between the cause of the tsunami and the shore. Distant-source tsunamis are relatively less intense due to distance, while near-source tsunamis would lack in buffer time and be of greater intensity. Effective warning and a fast and efficient evacuation are key to saving lives should such a tsunami occur. These maps show with accuracy exactly where a tsunami would reach and are invaluable tools when it comes to building for resilience and creating evacuation routes.

From warning people of an impending tsunami through the end of a successful evacuation, it is imperative to perfect the process in order to minimize casualties. NOAA monitors the Pacific Ocean for tsunami inundation using wave stations that allow them to decipher direction and speed and create accurate estimates of a tsunami's arrival (NOAA, n.d.). This ability to predict tsunamis is vital to the first step in the evacuation process: warning people of the approaching disaster and giving evacuation orders. After the call for evacuation, people within the hazard zone are generally required to self-evacuate, following local guidelines to escape. While many people, such as those with limited mobility or those too far from an evacuation point, may still require evacuating via car, some may evacuate on foot. In cases where there is a more advance warning of tsunami risk, evacuation can pose logistical problems, especially if too many people try to travel by car out of a dense area (N. Wood et al., 2018).

Mitigating Casualties

In order to mitigate casualties, it is important that people are educated about tsunami risk and that the city has effective wayfinding in place. Moreover, applying wayfinding to tsunami evacuation should include providing information and education so people can learn about issues around tsunami risk and evacuation in advance and improve their ability to react properly in the case of tsunami.

Education

Self-evacuation is only possible when people are informed about what tsunamis are, how to tell when a tsunami is occurring, and what to do when that happens. The more informed people are, the less the risk of people putting themselves in dangerous positions, not evacuating properly, or falling into chaos. One way to communicate and mitigate tsunami risk is preparatory education. NOAA identified three focus areas for tsunami education: recognizing the signs of an impending tsunami, understanding areas at risk, and knowing when and how to evacuate (Dengler, 2005). Education is especially vital because communities at risk of a near-source tsunami may only have a very short time to evacuate, so they should be able to recognize when a tsunami is imminent and evacuate quickly. Brochures, maps, videos, and many other methods have been used to educate locals on tsunami risk and evacuation. Tsunami education should emphasize detrimental assumptions. Research shows that people in an emergency, especially those familiar with the area, tend to fall back on habits that are not conducive to a quick evacuation such as sticking to road systems during an evacuation even though it would be faster to leave the road systems to cross fields or lawns, feeling uneasy going through wooded areas, or taking their car only to need to abandon it later (N. J. Wood & Schmidtlein, 2012). Having familiarity with the best methods and routes of evacuation can mitigate these behaviors.

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Anyone who goes within an area at risk of a tsunami needs to know how to react should one occur, including tourists, temporary residents, and other visitors to coastal regions (Kelman et al., 2008). They may not usually live within the area where tsunami information is distributed or even be as invested in learning due to their short-term stay. Nonetheless, these visitors are at equal risk of experiencing a tsunami event while staying in the coastal community. People unfamiliar with the area may encounter problems with evacuating, including not recognizing or acting on signs of a disaster like an imminent tsunami or preceding earthquake, evacuating when they do not need to and causing more congestion, or simply experiencing greater panic. Current methods of educating visitors about tsunami risk and evacuation are centered on encouraging those in the tourist industry or heavily touristed areas to have signage or information available or posted (N. Wood & National Research Council, 2011).

Wayfinding

Besides tsunami education, good wayfinding is another technique to mitigate casualties and confusion during an evacuation event. Wayfinding is the process of using cues in the environment to navigate a person's surroundings, whether it is familiar to them or not (Farr et al., 2012). Wayfinding has also been said to support adaptation to space and situation (N. Wood et al., 2020). Learning by making situation-based cognitive maps can make people better at choosing the best path based on the current condition. Wayfinding is a goal-driven reasoning chain that includes moving through a space while analyzing alternative options and making decisions based on imperfect observations of space (Hajibabai et al., 2007). Meaning, people will make decisions with the information they observe, and the more correct information they observe, the more likely they are to make better decisions. Thus, it is best that wayfinding is placed at the node of decision-making (Arthur & Passini, 1992)—in other words, where people

have to decide to change direction or take an action. Current tsunami wayfinding signage is based on this principle.

Preparation is important to saving lives and ensuring communities can come back from a tsunami (Samant et al., n.d.). Choosing the correct evacuation routes, clearly marking them, and educating people on how to use them are all important steps for preparing to make evacuation go smoothly. Signage and graphic imagery are basic and reliable tools used to mark tsunami evacuation routes. Signage, along with markers on the road, generally serve to orient, direct, instruct, or identify a destination (Neis et al., 2014). While signage is generally static, the use of technology including LED sign boards, interactive screens, lighting, or projections can introduce a changing or interactive element to it. In one study, 38% of people in an unfamiliar environment were unable to see typical static wayfinding signs, even when looking right at them (Xie et al., 2012). This inability to see signage can only get worse should the event happen at night. Using dynamic signs, in the form of signs with flashing lights indicating the correct direction, was found to assuage the lack of perception (Galea et al., 2014).

Most regions have strict guidance about how to make tsunami wayfinding visible and accessible by making signs recognizable even without the ability to read or in limited visibility. While lit or dynamic evacuation signs are shown to be more effective (Xie et al., 2012), they still are not common. Additionally, roads can collapse and become damaged due to preceding or succeeding disasters such as earthquakes, landslides, or fires, or due to problems during evacuation such as accidents or congestion. Due to these factors, it is important to be able to communicate not only one evacuation route but also changes in evacuation routes and alternative routes. Signs and communication regarding tsunami evacuation must also be accessible for all who use them. That includes needing to be understood by someone who only speaks a foreign

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language, someone who cannot read, someone who is color blind, someone who struggles to see well either in the day or at night, or someone who possesses other circumstances that could change what they can or cannot understand about tsunami evacuation signs.

While perfect signage is an important component of tsunami-related wayfinding, it is only one method of wayfinding. Utilizing techniques that create cognitive maps can supplement evacuation signs in supporting evacuees to make better decisions. Cognitive maps are essentially mental maps that people can use to navigate a space from memory. Repeated navigation of the space can increase familiarity and cause a person to acquire cognitive maps (Hajibabai et al., 2007). However, this can inhibit evacuation when those habits are not in line with those needed for swift evacuation (N. J. Wood & Schmidtlein, 2012). It is important that these negative habits are addressed in planning the evacuation routes, signage, and education.

Together with repeated navigation of the space, landmarks, or easily identifiable markers associated with specific locations, are often key elements of spatial cognition (Chown et al., 2001). Route instructions often use landmarks to help navigate, as either beacons (e.g., "head toward the tall building") or cues (e.g., "turn right when you see the red sculpture") (Waller & Lippa, 2007). Landmarks can act as cues and aid memorization. For example, instead of remembering binary directions, or even street names, which can be difficult to memorize, it is easier to remember to turn left at the tall tree or right at the purple flowers. Associations such as these can greatly aid recall. Well-known landmarks can also make it easier to communicate a route as opposed to alternative methods such as using street names or directional instructions (e.g., "50 feet forward"). Vague landmarks, however, can have the opposite effect of being non-transmissible due to a lack of mutual understanding. Landmarks are also useful for orienting people in a space. Orientation is also an important component of wayfinding, as disorientation

can severely impact a person's ability to navigate. With tsunami evacuation, people can usually orient themselves to head in an upward direction or to a known high point, but that may not always be the best course of action or obviously apparent, in which case significant education and wayfinding pointing to an alternate orientation would be very valuable.

Applying Wayfinding to Tsunami Evacuation and Education

According to Hajibabai et. al. (2007), locomotion is the guidance of oneself through a space made on immediate, local sensory perceptions and requires no cognitive map, such as seeing a tsunami evacuation route sign or seeing a hill and heading in that direction, whereas wayfinding is the planning and decision-making that allows a person to choose the correct route and navigate to a place beyond their immediate senses. Tsunami wayfinding is therefore a two-step process; first, creating cognitive maps via creating memorable landmarks and developing spatial cognition, establishing orientation, and providing instructions on how to identify the best routes before the evacuation is called for, and second, adding cues and symbols to aid in proper locomotion during the evacuation. Adding additional wayfinding should therefore attempt to accomplish at least one of the following:

- Raise awareness of tsunami risk and evacuation. The first step to preparing for tsunami risk is being aware of that risk, learning about the evacuation routes, and understanding the systems in place to aid in an evacuation. This can then initiate mental and physical preparation for a tsunami event.

- Identify or create landmarks. This includes landmarks that act as a beacon, a point of orientation, or a cue. It is important that this is combined with education so that people understand how to use it.

- Identify or create tsunami evacuation routes. To do this, wayfinding must attempt to overwrite existing negative habits regarding evacuation such as using education or wayfinding to teach people how to leave familiar routes in favor of safer and more efficient ones.

- Communicate decision-making strategies during evacuation. Humans will make rational decisions based on the information available to them, but a combination of education and wayfinding can help people acquire greater adaptability which can support them during an evacuation.

Public Art for Education and Wayfinding

This paper will look at public art as a tool for supplementing existing tsunami education and wayfinding. Public art is a broad term used for any artwork, temporary or permanent, that exists within the public realm and is openly accessible (Robidoux & Kovacs, 2018). *Permanent installations* have a more ongoing impact and their permanence gives them more placemaking power, essentially the ability to act as a local landmark or point of identity for the place or community at large; however, they can be susceptible to a host of issues including being more expensive, being disliked by the community (inherently or due to the high cost), requiring expensive ongoing maintenance costs, or being neglected (Robidoux & Kovacs, 2018). *Temporary installations*, in contrast, are generally less expensive and have been shown to generate more public participation and engagement, but are, of course, temporary and have less place-making ability or power to gain ongoing renown. However, if a temporary project is well-supported enough it can be made permanent. A purposeful strategy of going from temporary to permanent exhibits is using a tactical urbanism approach. Tactical urbanism by definition uses low-cost, temporary interventions to improve neighborhoods or urban spaces (Pfeifer, 2013).

Using this technique, communities could test installations first and then replace them with a more permanent version if it proves successful. This is a longer process which has the drawback of being more resource- and labor-intensive, but the longer process can aid in attracting more attention to the installation and the issue it represents as well as reduce concerns about spending too much money on an installation that is useless or that the community does not like.

For the pupuses of this paper, public art takes a broad meaning to include anything made with artistic intent. Both physical installations and events and activities are included under this definition as long as they aim to impact and aid the community through creative means. Under this definition, informational exhibits, markers, murals, sculptures, events, festivals, interactive art, lighting elements, sound elements, and many other physical installations and one-time or recurring activities occurring in the public realm count as public art.

Public art, both as a product and a process including community involvement, is important to emphasize a sense of identity for a place and incite attention and discourse within the community. Public art has increasingly been seen as contributing to a city's branding or identity, showing how connected public art is to the location they are set in (Redaelli & Stevenson, 2021). Public art used in this way can also connect back to the history or values of a city. The more connected to the community, the more impactful the art: for example, local artists tend to attract more media attention. Additionally, the literature has emphasized the importance of the process of public art and the participation and discourse it incites above the art itself or any object produced. The process, or more specifically the inclusion of artists and community in the development of public art, can be even more important than the project itself (Robidoux & Kovacs, 2018). The process of creating art can contribute to the transformation of communities over time by creating space for dialogue, pushing for new or alternative perspectives, and

causing shifts in societal understandings of issues (Duxbury & Jeannotte, 2011). Community

engagement is the foundation of any placemaking attempts, and public art is shaped largely

through community interaction with it (Cheung et al., 2022). Any public art made without

community interaction runs a much higher risk of facing rejection from the community. The

opposite is also true: the more a community participates in the art-making process, the more

likely they are to support it.

Public art provides many benefits to a community, including functioning as a tool for

education and social and behavioral change. Benefits of public art include beautifying cities,

adding value to communities, and improving quality of life (Cheung et al., 2022). To that end,

public art has often been considered a tool for aiding in economic revitalization by attracting

tourists and investors to a place (Hall & Robertson, 2001). Additionally, public art has been

linked to other benefits including contributing to local distinctiveness, increasing the use of open

spaces, and having a role in cultural tourism. Public art has also been argued to have educational

benefits: some art can have intrinsic educational value while others are accompanied by

educational programs. Public art is an effective tool for communicating, identifying, and solving

local issues (Robidoux & Kovacs, 2018). Art can inspire, excite, and promote thought and

behavioral change in viewers (Song, 2012). One installation in Boston, titled *High Tide*, was a

temporary landscape installation meant to show people locally how their neighborhood would be

impacted by sea level rise (Cheung et al., 2022). Researchers showed that the site-specific nature

of the public installation aided in increasing participants' reception of the messages of resilience

and sustainability.

While the existing literature does not detail the potential of public art as a tool for

tsunami education specifically, public art has been proven as an effective tool to communicate

and inspire dialogue around other issues in a community, such as the impacts of climate change. Therefore, it stands to reason that public art can also be an effective tool to educate people about local tsunami risks and preparation and equally, to encourage dialogs about them. Functionally, the use of public art to communicate information on local conditions and policy, attract attention, and excite people to interact with the topic and enact change is the same for both tsunami issues and other topics.

Public Art for Wayfinding

As defined in the previous section, wayfinding can often be described as either a cue or a landmark. Public art can act as a cue by being woven into existing infrastructure such as roads, sidewalks, or bridges to draw attention or add wayfinding (Kakulas & Neil, 2006). The most obvious form of public art as wayfinding, however, is as a landmark. Since public art is generally attention-drawing and memorable by nature, it is easy for it to become a beacon. Large installations or installations that draw attention to memorable spaces—such as cross-roads, large bodies of water, or areas of notable geography such as a hill—are especially useful as beacons since they can be visible for a long distance and so have a greater ability to help orient people in the space. For example, the Eiffel Tower can be seen from far away and can be used for orienting people in Paris, France.

Public art needs to accomplish a number of basic requirements to be most effective as a landmark aiding in orientation and wayfinding, displayed by the following hypothetical. Imagine driving along a freeway in the desert and looking for the right exit for a hotel. If they all look the same, then a person would have to scour the signs for the names of the exits and hope to either recognize or correctly guess one with a hotel. Maybe they are lucky and see a red house which they remember indicates the right exit. Even better is when they see a sign with icons showing

that the next exit has hotels, and better still is when they see a bright and obvious sign for a hotel chain. These examples show different aspects of using a landmark for wayfinding from least effective to most effective. First is wayfinding without a landmark, just based on names that are hard to quickly identify and memorize. Second is wayfinding using a recognizable landmark, but one without context (i.e. if the person did not know about the connection beforehand it would not help). Third is wayfinding using universal iconography—or using widely recognizable symbols to convey information. This is one of the most commonly used wayfinding techniques for tsunami evacuation signage since recognizable indicators are fast to read and generally easy to recognize. Fourth, and the last example mentioned here, goes a step further and includes increased visibility and adds more information without reducing readability. This fourth scenario is what public art as a wayfinding technique should aim to achieve: visibility, readability, accessibility, and detail.

The Importance of Public Art as a Process

Additionally, as previously stated, public art is valuable as not just a finished product but as a process. While tsunami-related installations are important to raising awareness of tsunami risks, the very process of installing them and sharing that process with the community can draw attention toward tsunami risk and evacuation. Additionally, using local resources and input and encouraging community participation to create the installation can strengthen the community and increase awareness as well (Hall & Robertson, 2001). This aspect of strengthening the community can have resounding effects on strengthening community resilience. FEMA defines community resilience as "the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions" (FEMA, n.d.). Strong communication, collaboration, and social connectedness in communities can help

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increase community resilience (U.S. Department of Health and Human Services, n.d.). After all, the more connected and invested in these communities people are, the more likely they are to come together and work to rebuild after a disaster occurs, and the more likely the community will be able to bounce back (Masterson et al., 2017; Simms, 2016). Public art can aid in making a community more resilient through its ability to aid in strengthening a sense of place and connection. This phenomenon is strongest when it is based on community input and resources.

Cultural Programming

Cultural programming can create a process by which a programmer can utilize local resources to create public art that reflects the local community. Cultural programming is defined as the process of planning and delivering art and cultural experiences for people (Carpenter & Blandy, 2008). This paper adapts principles provided by a foundational text on art and cultural programming written by Carpenter and Blandy, *Arts and Cultural Programming: A Leisure Perspective*. Programming is essentially a management activity focused on assessing the needs of the community and organizing a program of arts and cultural experiences to meet those needs. Programming is most valuable when people engage in the process of creating it instead of just benefitting from the program itself. In order to involve the community in the process of creating the program, a programmer should encourage, advocate, and enable the community rather than direct them to make something that properly reflects the desires and culture of the community.

According to Carpenter and Blandy, creating a cultural program is a cyclical process that includes five steps: needs assessment, program development (determine objectives), program implementation, program evaluation, and program modification (2008). First, during the needs assessment, those creating the program have to understand the needs of the community or target population. This step aids in creating the foundations of the program development. Second,

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during the program development stage, the programmer determines objectives for the program and uses them to develop a suitable program. Community involvement is very impactful and important to this stage as it allows the programmer to develop a program that appropriately responds to the needs of the community. Third, during program implementation, logistics and supervision of the active program are the focus of the programmer. Fourth, the program must be evaluated to determine if it meets its objectives and how it can be modified to be better according to that evaluation. Fifth, following this evaluation, appropriate modifications should be make to improve the program, and then cycle resets. Additionally, this paper proposes the importance of highlighting a Step 0, which is the preparatory work of establishing a target population that the program will aim to help. Only by establishing what people or community the program should aim to help can a programmer know whose needs should be assessed and enact an effective and equitable program.

Evaluation is a vital part of any cultural programming because that is what proves whether or not it is successful and allows for the program to grow more effective by bringing to light and addressing any shortcomings or inefficiencies. Evaluation should occur constantly throughout the process of ideating, creating, enacting, and concluding a program. Evaluation is the systematic collection and analysis of data based on criteria to make judgments about the success and shortcomings of a program (Henderson, 2008). By identifying shortcomings via evaluation, the programmer can then make adjustments to mitigate them. To evaluate a program, programmers must go through four steps: develop criteria, collect data, make judgments, and then make improvements. First, it is important to consider developing criteria before the implementation of the program. Criteria for evaluation can be many things. One example of evaluation criteria is created by establishing what the program should result in if everything went

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as planned. This can become the baseline and should include measurable values. By comparing the actual result to what was expected, a programmer can evaluate where a program is exceeding or falling short of expectations. Another important component of establishing criteria is to look back at the objectives of the program, since they indicate what the program aims to accomplish.

Program evaluation should include collecting comprehensive data about all aspects of the program. One way to approach data collection is using the seven levels proposed by Henderson's chapter in Doug and Blandy's *Arts and Cultural Programming*, which includes inputs, activities, people involvement, reactions, KASA outcomes (which stand for knowledge, attitudes, skills, & aspirations), practice change outcome, and end results (2008). Proper evaluation is ongoing, occurs throughout the whole process of creating cultural programming, and helps to further improve the program. Evaluations done before beginning the program, called assessments, examine need and help with further planning. Those done during the program, called formative evaluations, examine processes and efficiency in the program and help to improve it. Finally, those done at the end of the program, called summative evaluations, look at outcomes, impacts, and effectiveness and show if the program was successful in fulfilling its objectives. Only summative evaluations can include all seven levels of data collection proposed by Henderson, while assessments and formative evaluations include whichever information is available.

This paper will create a needs and evaluation framework that a programmer could use to create a program that implements public art as a tool for tsunami education and wayfinding. In order to go more in depth, Seaside, OR, a city with significant tsunami risk, will be used as a case study within which this process will be set. The *needs framework* will be inspired by the cyclical process for creating cultural programming introduced by Carpenter and Blandy and adapted to reflect the propositional nature of this paper and the importance of rooting the

program in the local community as was established in the previous literature review section on public art. It will include four steps: (1) establishing the target population, (2) assessing locational and community needs, (3) assessing local resources, and (4) determining possible directions of program implementation. The *evaluation framework* will examine five objectives any program aiming to use public art for the purposes of tsunami education of wayfinding should attempt to achieve and be evaluated on.

Part 2: Existing Conditions in Seaside, Oregon

Tsunami Risk in Seaside, OR

Seaside, OR is located along the northern Oregon Coast in Clatsop County. According to 2020 Census results, it has a population of 7,234 (*U.S. Census Bureau QuickFacts*, n.d.). The population consists of over 25% of people age 65 and older and 16% of people under 18 years of age. The city is 95% white with a Hispanic or Latino population of almost seven percent. Only about 40% of housing units are owner-occupied, meaning there is a high rate of short- and long-term rentals. Fifty percent of the population under 65 years of age is disabled—double the state average. Seaside also has a thriving tourism industry, although it was negatively impacted by the COVID-19 pandemic (City of Seaside Visitors Bureau, n.d.).

Gearhart, Oregon is located just north of Seaside and has a population of just over 1,000 people (Visit Oregon, 2021). Gearhart is less well-known than Seaside but similarly values tourism. Due to their proximity to each other, many emergency plans and inundation plans consider both cities together. However, their cooperation is limited due to a series of creeks in between them, which limit travel from one city to the other to the use a single bridge which leaves no room for contingencies and heavily increases chances of bottlenecks. Both Gearhart and Seaside are right next to the coastline and are almost entirely within the most liberal tsunami zone (DOGAMI, 2013a). Gearhart is slightly more elevated than Seaside so it would be less impacted by a distant-source tsunami, but it would be decimated by a near-source tsunami (DOGAMI, 2013a).
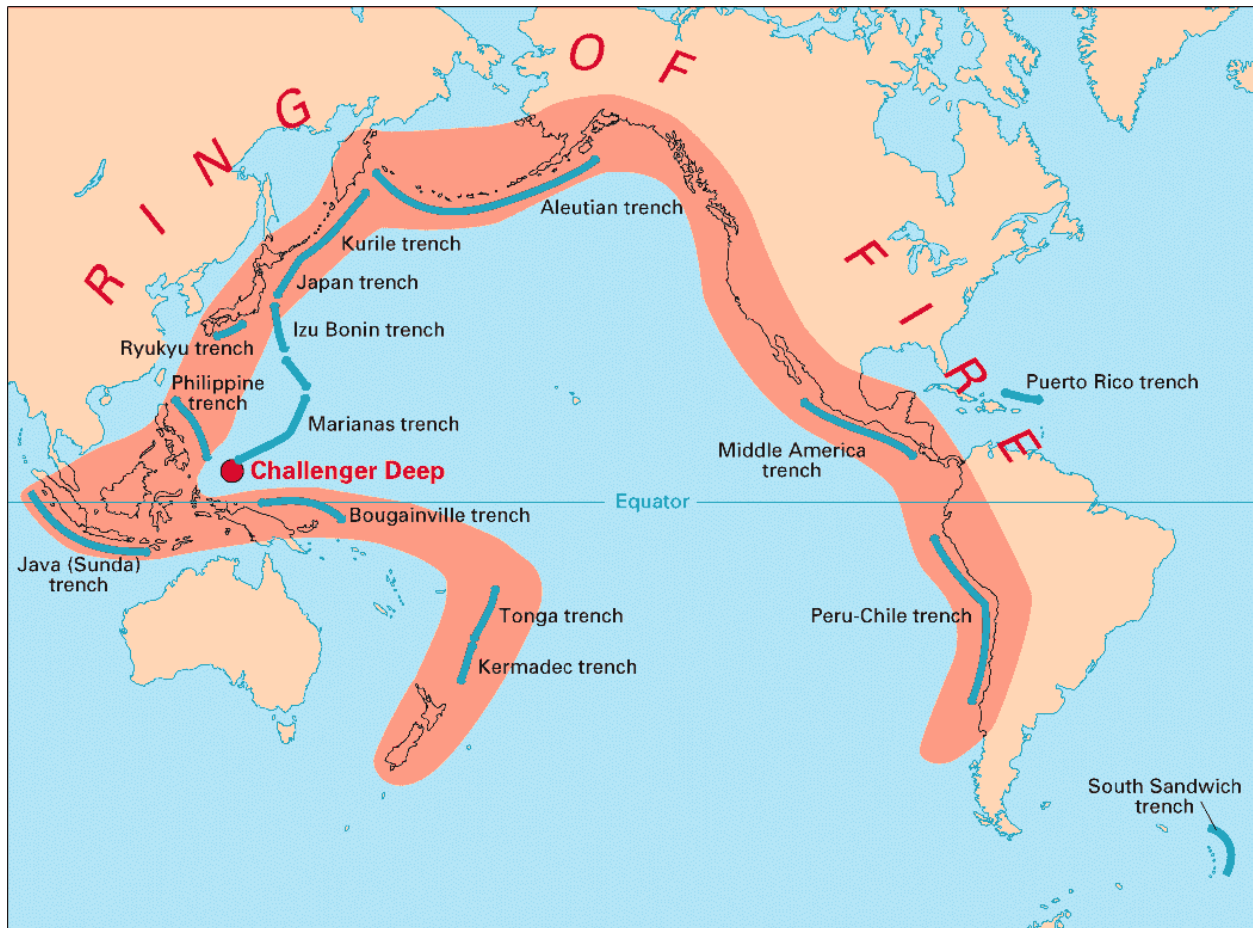
Fig. 1: The Ring of Fire (USGS, 2014).

The Oregon Coast is at notable risk of tsunamis due to its location along the "Ring of Fire": a circular line surrounding the northern Pacific Ocean along the Pacific tectonic plate and a few of its neighbors, which essentially lines the Pacific Ocean and is highly prone to volcanic and tectonic activity (Fig. 1). This means that the Oregon Coast is at significant risk not only from tsunamis originating elsewhere along the Ring of Fire, such as in Japan or Alaska, but it is also at risk of being the origin of a serious tsunami itself. The Oregon Coast has been affected by 21 tsunamis since 1854 (OEM, n.d.-a). The last tsunami occurred in 2011 as a result of the Great Tohoku Japan Earthquake and caused significant damage and the deaths of four people. This distant-source disaster is still small compared to what a local Cascadia Subduction Zone (CSZ) earthquake could cause. The CSZ runs along Western North America spanning from British

Columbia to Northern California (Neis et al., 2014). A subduction zone is an area where one tectonic plate subducts, or goes under, another. In the case of the CSZ, the Juan de Fuca Plate overrides the Pacific plate. Throughout the subduction process, the overriding plate tends to get caught on the subducting plate and builds up pressure until eventually the plate slips, the fault ruptures, and it creates an earthquake as the overriding plate dips down and out. The CSZ has fully ruptured at least 19 times in the last 10,000 years with between 110 and 1150 years between each event, the median time difference being 490 years apart (DOGAMI, 2013b). The last time the CSZ erupted was January 26, 1700, approximately 320 years ago. This means that the CSZ has the potential to erupt at any time now. The Oregon Department of Emergency Management (OEM) published the most recent State Natural Hazard Mitigation Plan (NHMP) in 2020 and stated that the probability of a magnitude 8.8-9.1 CSZ earthquake occurring in the next 50 years ranged from 7 to 12% and the probability of a small or large subduction earthquake occurring in that time is 37 to 43% (p. 223). Subduction fault ruptures have the greatest potential to create high-magnitude, disastrous earthquakes. A rupture along the CSZ is capable of creating above a 9.3 magnitude earthquake and a resulting tsunami of over 100 feet that would carve out much of the Oregon Coast (Neis et al., 2014). In addition, DOGAMI has used physical evidence to suggest that part of the coast could drop 4 to 10 feet as a result of the CSZ rupture, which means any tsunami generated would then reach much further inland since even a wave at sea level would rise to a 4- to 10-foot wave following the drop (DOGAMI, 2013b).

The CSZ and its potential for mass destruction was discovered by scientists in the 1980s (OPB, 2015). It had been undiscovered for many years due to the long timeframe between rupture and the fact that the last CSZ event was over 300 years ago in 1700. After spending decades building under the assumption that Oregon was at little to no risk of earthquakes or such

severe tsunamis, Oregon was not built to withstand such a disaster. Since the problem's rediscovery, Oregon has tried to rectify this by educating the populace about the possibility of a CSZ-related disaster, building more resiliently, and putting in disaster-mitigating engineering and wayfinding projects. Unfortunately, by most estimates, Oregon is still woefully unprepared over 40 years later.

Tsunami inundation maps for the Oregon Coast generally show potential damage for two different scenarios: a distant tsunami, likely occurring from elsewhere in the ring of fire which has its intensity reduced due to distance, and a CSZ earthquake and tsunami zone. A CSZ earthquake scenario is essentially a worst-case scenario, as the area it is expected to impact is not only much larger than the typical hazard zone, but it also has far less warning time since the tsunami waves do not have to travel as far to reach the local shore. While it can take hours for a distant tsunami to reach the Oregon Coast, it could only take a CSZ-generated tsunami 10-20 minutes to hit shore (OEM & DOGAMI, n.d.).

The distant-source tsunami inundation map for Gearhart and Seaside is based on two scenarios: Alaska M9.2 and Alaska Maximum (DOGAMI, 2013a). Both scenarios are based on a distant source tsunami originating from a subduction zone earthquake in Alaska. While both scenarios are based on a tsunami generated from a 9.2 magnitude earthquake, Alaska M9.2 is based on an earthquake that occurred in 1964 in Prince William Sound, Alaska, while Alaska Maximum is based on the theoretical worst-case earthquake where a uniform slip on 12 subfaults occurs. In both cases, the waves are expected to hit approximately four hours after the earthquake. In the Alaska Maximum scenario, 2,815 buildings or 61% of all buildings in Seaside are within the tsunami zone. Additionally, US Highway 101, a major coastal highway for traveling north/south through Oregon, goes through the tsunami zone and would likely be

impacted. Significant swaths of area in central Seaside that would be impacted by an Alaska

Maximum tsunami are zoned for general and resort commercial use as well as some high and

medium residential areas (Clatsop County, n.d.).

Alternatively, in the case of a local-source tsunami, the damage would be even more

severe (DOGAMI, 2013b). The local-source tsunami inundation map for Gearhart and Seaside

shows five possible scenarios for a CSZ rupture which they categorize as Small, Medium, Large,

Extra Large, and Extra Extra Large. For a "small" tsunami, the waves would hit the shore in

approximately fifteen minutes and reach maximum heights of over 20 feet, and for a "large"

tsunami the waves would hit in approximately thirty to forty-five minutes and reach heights of

over 70 feet. Fortunately, the more severe tsunami scenarios are much less frequent. In recorded

history, an "extra large" and "extra extra large" event have each only occurred once, in around

4000 and 7000 BC, respectively. However, even in the case of a "small" local tsunami, over 75%

of buildings are within the tsunami zone, and in the case of "extra" and "extra extra large"

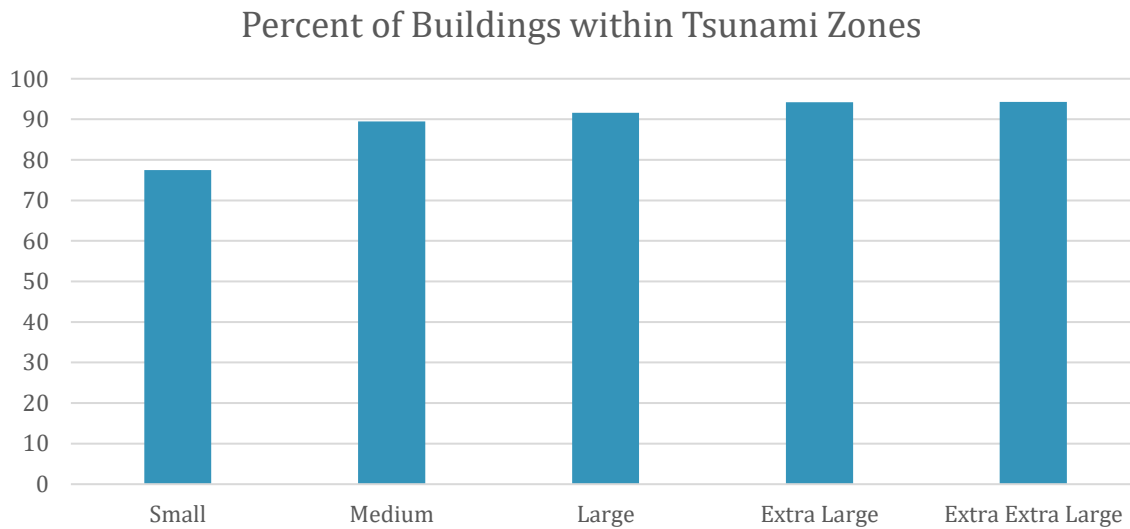events, that number climbs to over 94% (Fig. 2). Also within the small and medium tsunami

Fig. 2: Percentage of buildings in Seaside, OR within tsunami zones of varying severity
(DOGAMI, 2013b).

zones are multiple schools, seaside fire and rescue and police departments, and a large portion of Highway 101. A medium-sized tsunami also has the potential to reach the local hospital.

Seaside Evacuation Routes, Wayfinding, and Education

Seaside's evacuation process is clearly outlined in its maps of evacuation routes (City of Seaside, n.d.-b). In the case of an earthquake, their instruction is to head to high ground immediately. There are also five tsunami warning sirens in Seaside along with three sirens in Gearhart that will sound in the case of a tsunami. Seaside also has eight assembly areas outside of the tsunami area that people are to evacuate to, in addition to other possible assembly areas in Gearhart for cases where the tsunami is less severe. Gearhart is located just north of Seaside with only a creek to separate them, but with only one bridge connecting the two towns, it is not often the best evacuation route. Except for the far southern areas of Seaside which would evacuate further south, the high ground is uniformly east of the city. Seaside's pedestrian evacuation map for a CSZ event gives more details about expected bridge failures and pedestrian speed needed to escape in time (Fig. 3). The map shows six expected bridge failures, leaving only four intact and requiring most people in the central area of Seaside to go much further to get to a feasible bridge. Partially due to this and the proximity of this area to the beach, the map recommends that anyone in this area jog to get out in time. The area in the North of Seaside, such as near Holliday Drive, is the only area so far from an assembly site they recommend running to be able to escape in time.

Unfortunately, simple instructions to head east to evacuate are complicated by the rivers that divide up Seaside. Large portions of central Seaside, particularly areas inside the tsunami zone, are cut off from higher ground due to rivers and creeks which means for many, evacuation

Fig. 3: Pedestrian Evacuation Map for Seaside, OR (University of Oregon InfoGraphics Lab & DOGAMI, n.d.).

would require locating and crossing at least one bridge. This alone can complicate an escape route and cause bottlenecks since it limits the routes people can use to reach higher ground. Furthermore, infrastructure such as bridges can become damaged due to a CSZ earthquake as well and can complicate evacuation, so contingencies must be put into place in case they are rendered unusable (Fig. 3). One example of this is the west bridge on Broadway, which is a major route out of the city and toward higher ground, but which is expected to be compromised in a CSZ event (A. McBride, personal communication, November 17, 2022).

Current tsunami wayfinding in Seaside is mainly signage designed to be very recognizable and is supplemented by digital resources. There are online programs that will give the user an evacuation route after they input a location as well as multiple versions of evacuation route maps available online. Within the city, they also use signage and other visual cues to aid wayfinding (OEM & DOGAMI, n.d.). Guidance for tsunami wayfinding in Oregon states that evacuation routes should be clearly marked with signage along the entire route, constantly maintained, in high-traffic areas visible from the beach, and include a Spanish translation. Signage as used by the guidelines includes vertical signs and signs painted on roads or pathways. There are also many guidelines for maximizing the visibility of the signage such as ensuring good line of sight, using icons that are more easily understood than words, using 3" text for good visibility within 30', and 6" text for good visibility within 60', and using illuminated elements such as fluorescence, solar panels, and energy-efficient LEDs for increased visibility in night or foggy conditions. Currently, Seaside uses five kinds of signage (Fig. 4). Additional wayfinding tools used along the Oregon Coast are the "blue line," a painted blue line on paths or roads that indicate safety and having left the tsunami zones, and accessories such as flexible delineator posts, blue arrows along the roadway, raised pavement reflectors, and specific lighting.
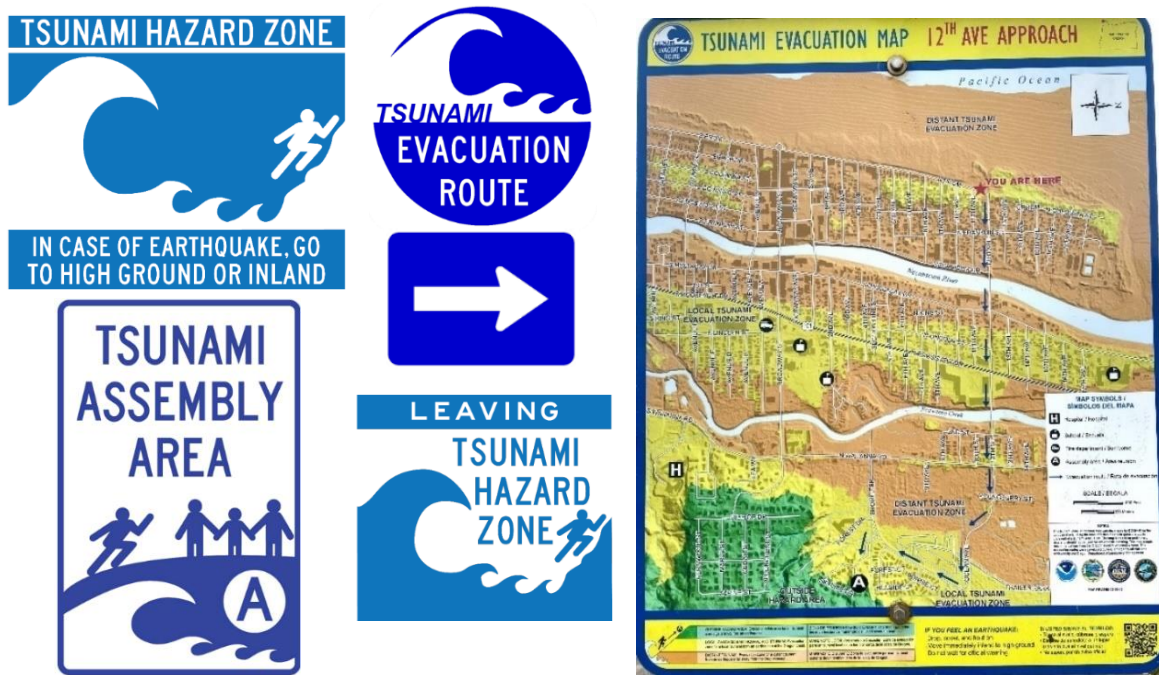
Fig. 4: Current evacuation signage in Seaside, OR: tsunami hazard zone signs (upper left), tsunami assembly area signs (lower left), tsunami evacuation route signs (upper middle), entering/exiting tsunami hazard zone signs (lower middle), and "you are here" signage which displays an evacuation map (right) (OEM & DOGAMI, n.d.).

Tsunami education must be conducted through a variety of methods in order to reach everyone. The most obvious resource for tsunami information is on the internet and specifically the City of Seaside's webpage, where myriad resources are available for every issue that can be connected to tsunamis. Trainings for creating tsunami plans for facilities or businesses are also available. The city regularly participates in outreach to grammar schools, which supplements the tsunami drills conducted in the schools and outreach at the Get Ready Clatsop Readiness Fair, a county-wide disaster preparedness event occurring in October (*Get Ready Clatsop County*, n.d.; A. McBride, personal communication, November 17, 2022). The city also makes many outreach materials available. Free resources, key sleeves, and printouts of varying types are available for businesses with visitors (OEM, n.d.-b). While they vary in content and appearance, they

generally contain instructions for what to do if the ground shakes (essentially drop, cover, and hold on, and then run to high ground and stay there), information about the difference in the time it takes for the waves to hit for distant- and local-source tsunamis, and QR codes for more information.

Seaside has also made an effort to raise awareness among tourists by encouraging hotels and other accommodations to promote tsunami education. In 2015, Seaside had a tsunami awareness initiative that encouraged hotels to use government-provided key sleeves with the information mentioned above, but it was met with mixed feedback (The Colombian, 2015). While some believed it did help raise awareness, many hotels were hesitant and believed that it made visitors anxious. The City of Seaside currently cannot require hotels to post any information on earthquakes, tsunami preparedness, or evacuation (A. McBride, personal communication, November 17, 2022). Vacation Rental Dwellings (VRDs) is the term used for legal short-term rentals in Seaside that require a permit from the city. Among the requirements for VRDs is that a tsunami evacuation map must be posted in a visible place (City of Seaside, n.d.-d). A NOAA weather radio that is tuned to channel 1 to accept local weather warnings such as storm surges is also required in all new residences or vacation homes (A. McBride, personal communication, November 17, 2022; *NOAA Weather Radios*, n.d.). In cases of significantly higher risk such as "king tide"—a term for an especially high tide—Community Emergency Response Team (CERT) volunteers will be posted along the beach to encourage tourists to stay away (A. McBride, personal communication, November 17, 2022).

Seaside has also made additional plans and resources available to help evacuation go smoothly. There are a total of 119 supply barrels which contain three days' worth of supplies for twenty people stored in the garages of volunteer resident homes above the inundation line (A.

McBride, personal communication, November 17, 2022; *Tsunami Supply Barrel Program*, n.d.).

If a tsunami evacuation were to occur, these barrels would be rolled out to help supply the

evacuees. Additionally, Seaside instructs that people in need of assistance when evacuating tie

something white, such as a towel or sheet, to the front doorknob (City of Seaside, n.d.-b). This is

only for cases of distant-source tsunamis, however, since a local-source tsunami would occur too

fast for this measure to help. The City of Seaside can only prompt people to plan and be prepared

for a local-source tsunami. To this end, the City of Seaside also instructs people to be prepared

with an emergency kit with a two-week supply of food, water, medicine, and other items for each

family member in case disaster strikes.

Part 3: Creating a Cultural Program for Seaside, Oregon

Effective wayfinding and a well-informed public are two necessary components to successful self-evacuation in the case of a tsunami. Current tsunami education and wayfinding in Seaside, OR is limited in its approaches. Based on principles illustrated earlier, a program for developing public art can be a way to further strengthen their current strategies. Adding additional wayfinding in the form of public art should *supplement and not replace* existing signage. Public art could raise awareness of tsunami risk and evacuation procedures, identify or create tsunami evacuation routes, identify or create landmarks, and communicate decision-making strategies during evacuation. Additionally, the process of creating this program should focus on creating and strengthening community ties.

As defined in the literature review, wayfinding is a tool to help people navigate their surroundings, whether it is familiar or not (Farr et al., 2012). To do this, wayfinding is often utilized in the form of cues in places where people have to change directions or take an action (Arthur & Passini, 1992; Waller & Lippa, 2007). Current tsunami wayfinding signage does this, but static signage is not always recognizable in an unfamiliar environment, even when looking right at it (Xie et al., 2012). Making signs dynamic, such as through the use of lighting, can mitigate the lack of perception (Galea et al., 2014). In addition to cues such as signage, landmarks are also a component of wayfinding (Waller & Lippa, 2007). Landmarks are generally very recognizable and memorable and aid with orientation.

Public art provides a unique tool for adding additional tsunami education and wayfinding to the public realm. Public art, as defined in the literature review, is any art, temporary or permanent, that exists within the public realm and is openly accessible (Robidoux & Kovacs, 2018). For this paper, art also takes on a broad meaning to include anything made with artistic

intent. Permanent installations have a more ongoing impact, which gives them more placemaking power, though temporary installations are generally less expensive and generate more public participation and engagement. Temporary installations can also be used to test before committing to a permanent installation. Tactical urbanism by definition uses low-cost, temporary interventions to improve neighborhoods or urban spaces (Pfeifer, 2013). Using this technique, communities could test installations first and then replace them with a more permanent version if it proves successful. Public art has been shown to help establish a sense of place in communities—an important element of community resilience (Cheung et al., 2022; Masterson et al., 2017; Simms, 2016)—inspire behavioral change, and act as a valuable tool for identifying, communicating, and solving local issues (Robidoux & Kovacs, 2018; Song, 2012). Public art is also useful in multiple contexts for wayfinding, mostly either acting as a memorable and visible landmark or as cues throughout the landscape. When used as wayfinding, public art should aim to be visible, readable, accessible, and have a component of detail or depth.

Public art is valuable as not just a finished project, but as a process: while tsunami-related installations can raise awareness of various aspects of tsunami risks, the very process of installing them and sharing that process with the community can draw attention and get people involved in the issue (Duxbury & Jeannotte, 2011; Robidoux & Kovacs, 2018). Additionally, rooting the installation in the community through the use of local resources, input, and community participation can strengthen community ties and increase awareness as well (Hall & Robertson, 2001). This section focuses on the process of creating public art for tsunami wayfinding.

This process is a cultural program created in two steps: the *needs framework* and the *evaluation framework*. The needs framework is inspired by the cyclical process for creating

cultural programming introduced by Carpenter and Blandy (2008) and adapted to focus on the steps leading up to creating the program. It will include four steps: (1) establishing the target population, (2) assessing locational needs and establishing a process to learn community needs, (3) assessing local resources, and (4) determining possible directions of program implementation. The evaluation framework is the key to determining the success of the program throughout the process and allowing the programmer to identify weaknesses and make changes to make the process and end result more successful. This paper will identify five key objectives along with ways to establish their success and what data should be accumulated throughout the process in order to determine success.

In this illustration of the needs and evaluation framework, I provide a few examples of how the concepts could be implemented that are meant to guide and inspire. Community participation is essential for aiding in the creation and approval of a final implementation. Nonetheless, the examples provided give the programmer a starting point to bring to the community to start discussions on how to create a program they are satisfied with.

Needs Framework

The needs framework is the basis for creating a public art program to aid in education and wayfinding for tsunami risk in Seaside. It starts by assessing the needs of the community by establishing any target populations that would benefit more or that have a greater need for such a program, any locational or community needs specific to the area or target population, and the local resources that can be utilized by the program. This assessment is then used to determine possible directions of program implementation. This approach means the final iteration of the program has been evaluated through a public involvement process, has been determined to

address the needs of the community it impacts, reflects and supports the local character of the city, and helps foster a stronger sense of place in Seaside.
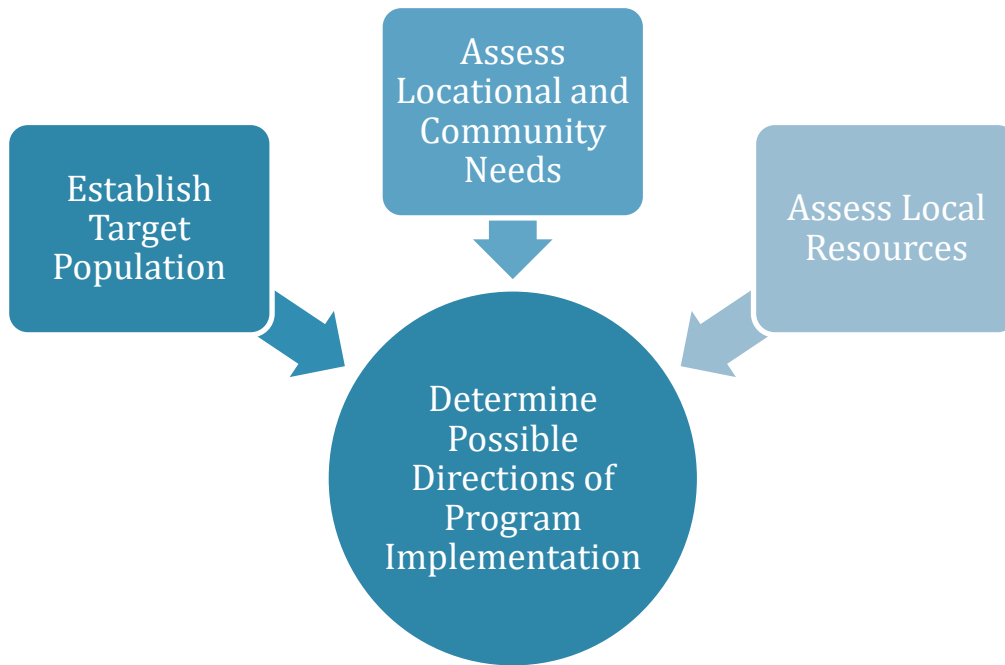

Fig. 5: Need framework.

Establish Target Population

The goal in establishing a target population is to find any key groups of people within the community that have a greater need that can be addressed by the education and resources provided by this program. A population with greater needs is one that has a higher risk, generally due to factors that make knowing how to evacuate and preparing in advance for a tsunami more necessary, or for populations with an insufficient understanding of tsunamis and evacuation. For example, those in areas where evacuation is more difficult, families with small children, people with limited mobility, etc. may benefit greatly from more preparation in advance. Additionally, there are many target populations that might have less awareness of tsunami evacuation such as tourists, temporary visitors, or part-time residents (N. Wood & National Research Council, 2011).

Target populations are identified through data and community outreach. Data can indicate possible target populations such as identifying areas with a higher risk of tsunamis or limited evacuation time, but that should be backed up by community outreach. Community outreach is a good way to establish the existing conditions of local knowledge of tsunami evacuation and preparedness. A multi-pronged approach of using surveys and methods such as tabling at events or community meetings allows the programmers to talk to members of the community, note areas of concern, and find populations where there is greater room for improvement regarding education and preparation or the program is expected to have the greatest impact. It is important to vary the modes of outreach including details such as time, location, and day of the week, in order to try and reach as many people as possible and increase accessibility of participation. If no notable disparity or target population is found, then the programmer can identify all of Seaside, including locals and tourists, as the target population.

Assessing Locational and Community Needs

Locational needs are identified when the conditions of the area create a greater risk or a greater need for people to have pre-existing knowledge of evacuation routes. For example, most of the coastal area of Seaside is separated from higher ground by a river or creek and requires people to find a bridge to cross, but some bridges, such as the western bridge along Broadway St., are expected to be unsafe during a CSZ event (University of Oregon InfoGraphics Lab & DOGAMI, n.d.). This means while many might think of these bridges as the shortest escape route due to proximity, escaping via that route is inadvisable (A. McBride, personal communication, November 17, 2022). Avoiding the possible bridge failures is not necessarily common sense and, should someone not know, they could be at a greater risk of harm. That is why areas like these bridges are important targets of future education. Community needs are any

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needs held by the community. If a target population is identified by the previous step, the disparities that caused it to be a target population are likely indicative of their needs. For example, if the disproportionately large disabled population of Seaside was chosen, the programmer should aim to address their needs. These may be more accessible wayfinding or a greater need to prepare for a tsunami event in advance. Other community needs may be brought up by community members and interested citizens.

Needs must be established through community outreach. Addressing a need that the community does not agree with rarely helps them. For example, the Council of the City of New York passed the Percent for Art (PFA) law in 1982 which required that one percent of the budget for City-funded construction went to artwork for City facilities (City of New York, n.d.). The program is largely successful and has now led to almost 300 works being completed. In 2015, the City commissioned sculptor Ohad Meromi's "Sunbather," which was met with severe public backlash (Malone, 2015). Some people hated how it looked and many resented the $450,000 price tag, believing the money would be much better spent elsewhere. The controversy was so loud that the City Council passed the first amendment to the 1982 law adding community outreach through a public meeting early in the PFA project's design process and other tweaks to require public feedback.

Fig. 6: Design proposal by Meromi for "Sunbather" (left) (Semple, 2015) and final product (right) (Sigler, 2017).

The recommended way to establish community needs and desires is as follows, considering that this process is completed when there is a finite and achievable list of community-backed needs to address:

1. Establish possible locational and community needs through logical analysis.

2. Use the preliminary list of possible needs for outreach. Outreach may include online outreach, tabling, community meetings, and more. Display the list of possible needs to the community and ask them to choose from three options: disagree with a need, agree with a need, or add a new need.

3. Take in this feedback after each round of outreach and update the needs to reflect feedback.

4. Continue this process until the community has had a sufficient chance to add needs and then shift to using community feedback to prioritize needs.

Assessing Local Resources

Strong community ties and a sense of identity and place are all important components to making a city more resilient (Cheung et al., 2022; Masterson et al., 2017; Simms, 2016). Strong community ties can lead to more participation in community events and planning and can also mean that people have more connections and resources in the case of a tsunami event (HSS, n.d.). A strong sense of identity and place is important to rebuilding after a disaster since people are less likely to invest in fixing something replaceable. If a place is special and people have more connections to it, they are more likely to want to come back or stay even after something happens. Utilizing local resources in this project, whether material or human, can help both create and strengthen community ties but while ensuring that any resulting product reflects and supplements the existing identity of the area.

There are three major local resources to assess to be able to proceed with this project. First, outreach and community involvement resources, which means utilizing existing community networks and information-spreading systems. Public art is largely shaped through community engagement, so the ability to connect with the community is crucial (Cheung et al., 2022). Outreach and community involvement resources are those that help the programmer connect to the community for feedback and ideas, and to increase the impact of the project. These are often existing community ties the programmer can utilize to gain and spread information. This may take many forms such as neighborhood or community organizations, clubs, nonprofits, and others that can bridge the community and the programmer. Programmers should be cognizant of trying to strengthen these existing community ties by feeding resources back to these organizations or adding to the existing network of connections.

Second, labor and physical resources essentially mean using local inputs. Using local labor all along the way ensures that the project is handled by locals who have a stronger connection with the area and community and a sense for what makes Seaside unique. It also means that the money put into this program stays within the community and supports the local economy. The programmer should use local artists but can also use local fabricators, installers, promoters, event coordinators, and any other labor source required. The inclusion of local artists and the community in the development of public art can be more important than the resulting product (Robidoux & Kovacs, 2018). Using local physical resources is also important to helping create a connection to Seaside. Most likely, this would be in the form of local materials such as rocks or woods from the area or more unique materials like recycled plastic from the beach or local crafts.

Third, it is important to identify monetary resources early on in the process. Funding could be local, but also from federal or state grants. In particular, it is important to understand any specific requirements attached to the grants, since such reqirements may impact how the program is implemented. Funding will often support one of the two sides of the tsunami-based art program: funding toward the arts, or funding toward disaster education and mitigation. Currently, the City of Seaside does not budget specifically for public art, though it could be folded into community development (City of Seaside, 2022). State funding sources can be from organizations like the Oregon Arts Commission (OAC). For example, their Arts Build Communities grant "provides $5,000 matching support to arts and other community-based organizations for projects that address a local community problem, issue or need through an arts-based solution" (Oregon Arts Commission, n.d.). Federal funding is available through programs such as FEMA's Building Resilient Infrastructure and Communities (BRIC) grant which aims to support "research-supported, proactive investment in community resilience" (FEMA, 2022). For the FEMA grant, a public art program could be combined with a multi-pronged approach to increase community resilience through a variety of methods. Another source of federal funding is the National Endowment for the Arts (NEA). NEA's Our Town grant aims to support creative placemaking (NEA, 2023b). They have awarded grants to communities like Berea, Kentucky, where the funding went to helping implement creative, visually orienting signage to establish a sense of place and help local residents and visitors to navigate through the important areas of the community (NEA, 2023a). A program that uses creative placemaking methods to educate people about tsunami risk and evacuation would also fit with this grant.

Possible Directions of Implementation

Once the programmers have established any target populations, created a list of community or locational needs, and assessed local resources for this project, they can begin to craft an implementable program. While a comprehensive, long-term approach is excellent, likely a more feasible route is using a series of short-term approaches to first establish credibility for the program and provide the opportunity to evaluate and make any changes to the program early on. Tactical urbanism is a toolbox of low-cost, temporary interventions that would work in this case (Pfeifer, 2013). Below are examples of what can be done to address two specific groups: tourists and families with young children.

Example 1: Tourists

Say that after analysis the programmer determines that the target population of this project includes all hotel tourists in Seaside, with a focus on hotel guests who are less likely to see information about risks in the area. With that in mind, the programmer chooses the lack of education for hotel tourists as the need which should be addressed by the program. To address that need using local resources, a program could create an art contest to create a design that attracts attention and raises awareness among tourists and then commission local artists to create it in reality. Multiple winners could be chosen, and school kids and community members could have two separate brackets to draw more attention. Older school children can be a valuable source of free labor while also being an important audience for tsunami education, but it is important to also draw in other members of the community. The publicity of unveiling a product created by the program is an important component of increasing awareness and attracting attention to tsunami risk and evacuation. Having an unveiling ceremony in the summer along with some publicity to help spread awareness is one way this could be done.

Example 2: Families with Young Children

If the goal of the program was families with young children, another possible program would be to create an event over the summer similar to a scavenger hunt that guides families through a proper evacuation route while having additional stations along the way with information about spotting or preparing for a tsunami event. The event could be staffed via volunteers or a relevant community organization. Local groups could also be asked to create educational stations, or the programmer could coordinate with local teachers to task middle or high schoolers with creating posters to put up along the way. Small shops in the area may also donate some prizes in exchange for visibility.

Evaluation Framework

The needs framework will result in an implementable program that will be further articulated through an evaluation framework. Program evaluation is based on determining objectives, which the programmer can use to determine the program's success. Objectives start out vague by detailing what should be accomplished by the program, and as the program takes shape, they evolve into distinct and measurable indicators of success. In many cases, an objective has a baseline and a goal. The baseline establishes the original condition, and the goal establishes what the program wants to achieve. Knowing the baseline helps to determine a feasible goal. For example, if the goal of the program is to raise knowledge among beach visitors about evacuation routes, the baseline may be how informed beach visitors currently are about evacuation routes, which can be determined using surveys. This information can then be used to set a goal. If many people, 50% for example, consistently answered that they are unclear about the nearby evacuation routes, the programmer could choose what they believe is a reasonable goal, such as lowering the number of people who are unclear about evacuation routes to only 25% or less.

A second set of surveys given after the program is implemented could then show if the program met the goal that was set. If the program is truly successful, it would meet that goal. If the program did not meet that goal, some tweaks or a shift in direction may be required. Establishing these objectives and maintaining consistent evaluation of them allows programmers to judge any areas where the program is not meeting expectations and make changes that allow it to be more successful. If target populations were identified, the impact on these populations should be specially noted to ensure the program is sufficiently impacting those with a greater need. For this section, I will examine the following objectives for programs that use public art to increase awareness and wayfinding around tsunamis.
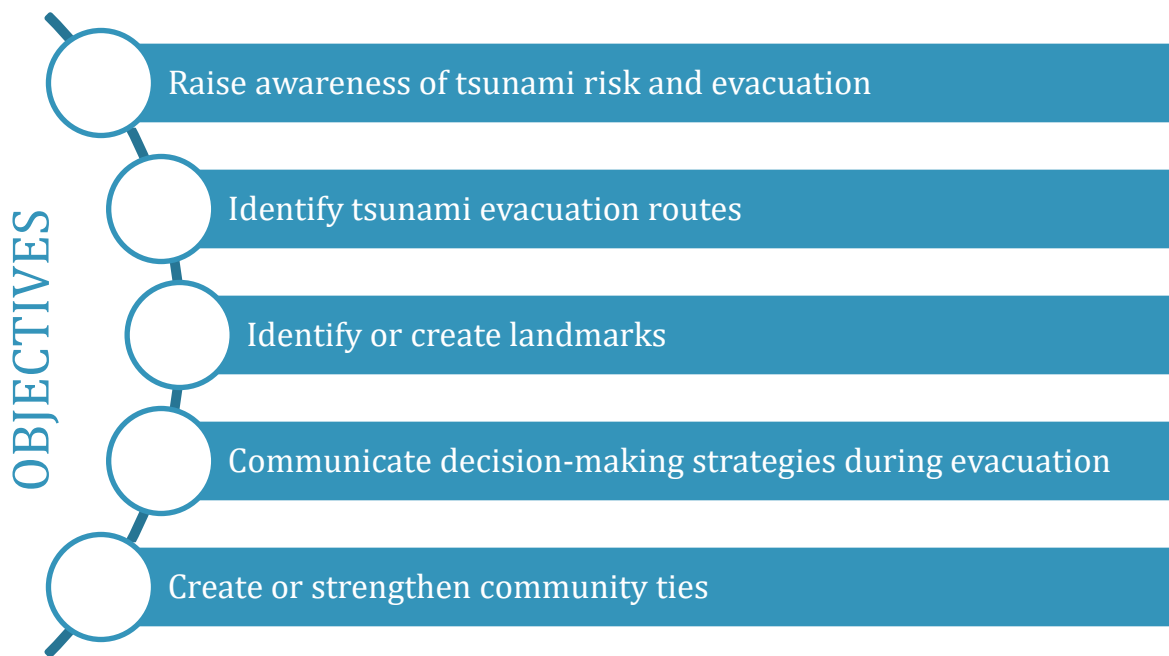

Fig. 7: Evaluation framework.

Raise Awareness of Tsunami Risk and Evacuation

The purpose of this objective is to educate people about and draw attention to tsunami risk, indicators, evacuation, and resources so that in the case of a tsunami event, more people will respond fast and correctly. Everyone—whether a tourist or a resident—who enters a tsunami

zone should know how to act should a tsunami occur (Kelman et al., 2008). Well-informed people may also be less likely to take undue risks and more likely to adequately prepare. Of course, what exactly the program is going to educate people about or call awareness to has a lot of leeway. Utilizing the history and culture of Seaside can be a strong way to raise awareness of tsunami risk and create an educational narrative. For example, the many stories of locals who experienced the effects of the 9.2-magnitude earthquake that hit Alaska in 1964 and flooded parts of Seaside may be a fascinating source for inspiration (Seaside Visitors Bureau, 2019). Older stories from the Clatsop Tribe that first inhabited the area may also contain traces about historical tsunamis that could be highlighted. The stories collected could be used to inspire a monument or mural that illustrates an important story that is designed by a local artist and accompanied by an informational sign in a prominent place that sees a lot of pedestrian traffic, such as the promenade along the beach. Another possibility is that many stories could be collected from residents and visitors and used to create a collage that forms an image, either 2D or 3D, that represents tsunami risk in Seaside. In any case, the final product would be determined by community participation.

Success for this objective can be measured by participation in the program, increased knowledge and preparedness in the community and its visitors about tsunami risk and evacuation, and increased constructive discourse around risk and risk mitigation. Some data that a programmer can collect which may indicate success for this objective are the number of participants, community-wide surveys from before and after the program implementation about how aware or prepared the community is, participation counts for related events (such as existing events around tsunamis and preparedness like the readiness fair), or viewing numbers for online

materials about tsunamis (seen in the number of times a relevant website is accessed on the City's website).

Identify Tsunami Evacuation Routes

The purpose of this objective is to make the proper evacuation routes clearer. Emphasis should be placed on areas of special concern where it is less intuitive and current wayfinding techniques could benefit from being reinforced (Arthur & Passini, 1992), such as areas where a person would have to run in order to reach safety in the case of a local-source tsunami or areas where a bottleneck or road failure might occur that people should avoid. More complicated evacuation procedures unique to Seaside such as how to exit the beach swiftly, which bridges are more viable in a near-source tsunami event, and other potentially dangerous routes such as the Sunset Boulevard route to the south assembly area are good places to focus education (A. McBride, personal communication, November 17, 2022). In some cases, increased education about existing wayfinding signage may also help. Familiarizing visitors with a map of Seaside may also help people evacuate faster, but it would need to be done in an engaging way, such as by using symbolism throughout the city to help people remember.

Success for this objective would mean that a high percentage of people in Seaside either know how to evacuate or can find out in enough time to escape. Since it is hard to check this in practice, some data that the programmer can collect to measure the level of success is before and after data—giving a selection of people a survey before and after interacting with the program to see how their knowledge about tsunami evacuation routes increases—or community wide-surveys as mentioned in the previous section. By establishing where the shortcomings are from these surveys, or where people tend to be the most uninformed, the program can make changes along the process to become more successful.

Identify or Create Landmarks

The purpose of this objective is to assist with wayfinding via establishing landmarks. As mentioned earlier in the paper, landmarks can be very helpful to wayfinding, especially when they are highly visible and memorable (Waller & Lippa, 2007). Landmarks for tsunami wayfinding should also be very clear and readable. As mentioned in the previous section, symbolism along a map of Seaside might help people remember the area and evacuate faster. This could include using various colored installations of paint in different districts that indicate which evacuation assembly area is closest (University of Oregon InfoGraphics Lab & DOGAMI, n.d.). For example, orange could be used for areas that evacuate to the area east of Salminen Ln., green could be used for those evacuating to the sites east of Lewis and Clark Rd., and so forth. Symbols, such as using salmon instead of orange and starfish instead of green could have the same effect. These types of installments act like cues and help people in areas where they have to make decisions. Larger, solitary landmarks can also be useful, such as adding art in key areas to create a beacon. A beacon in Seaside could draw people to an evacuation assembly area or the reverse. A widely visible beacon near the beach that shows the expected flood zone can also be utilized to encourage people to get higher than the installment and remain away from the beach. The key to any landmark is to educate people on how to use it and ensure it is well known; otherwise, they are just there for aesthetic purposes and not useful in this context.

Success for this objective would mean that visitors and community members connect a certain landmark with evacuation so that when evacuating, that landmark comes to mind in a way that helps them evacuate better. There are multiple evacuation routes, so one landmark cannot work for everyone, but pedestrian-heavy areas with only one or maybe two routes may benefit from a clear landmark. Data for this is more difficult to find, but methods used in the

previous sections, such as community or user surveys may provide an indication. In addition, community feedback and anecdotal evidence of people talking about the landmark can be used to judge success. Since a landmark is only successful if it is well known, any evidence of its renown is useful.

Communicate Decision-making Strategies During Evacuation

The purpose of this objective is to create more adaptive citizens that can successfully evacuate even under changing conditions. Natural disasters, as much as we plan and prepare for them, are unpredictable. Car accidents, unexpected road failures, or events such as landslides could all disrupt evacuation. Relying on normal habits during an evacuation can inhibit a person's ability to adapt (N. J. Wood & Schmidtlein, 2012). This is why it is important to not only impart information about risk and evacuation but also proper decision-making strategies that will allow people to better evacuate even under the stress of a tsunami event. In Seaside, some important topics to address are how to immediately react to a CSZ earthquake and the subsequent tsunami; more complicated evacuation procedures such as how to choose which assembly area to head toward; how to exit the beach swiftly; which bridges are more viable in a near-source tsunami event and what to do if a bridge is out; and methods of evacuation such as whether to evacuate by car or walking since, due to the limited routes out of the city, heavy car traffic could cause serious bottlenecks (A. McBride, personal communication, November 17, 2022). These topics often combine well with the other objectives. The previous example of using colors to point out the nearest evacuation route would also work to teach people how to make decisions quickly. A modified version of that example could also use colors or symbols to indicate whether people should walk, run, or jog to be able to evacuate in time. The example in the needs framework section for families with young children of using an interactive scavenger

hunt also provides a lot of opportunities to teach decision-making strategies though either mini-games or proposing obstacles in the clues and teaching participants how to overcome them.

To establish what success looks like, the programmer should first decide what decision-making strategies the program will try to communicate, such as how to react to a blocked escape route, how to access online resources and immediate information about the evacuation, or how to cut through private property or otherwise avoided areas rather than simply following the roadway in the name of evacuating faster. To establish success, the program could be designed in a way that tests how well people learned the concepts by including small quizzes or challenges in exchange for small prizes or bragging rights. Questions about how comfortable people feel about their ability to overcome obstacles or how to react to a tsunami can also be added to community or user surveys, particularly if the surveys are already being used to evaluate the success of other objectives.

Create or Strengthen Community Ties

The previous four objectives—raising awareness of tsunami risk and evacuation, identifying creating tsunami evacuation routes, identifying or creating landmarks, and communicating decision-making strategies during evacuation—are based more on the product or end result of the program. However, the fifth and final objective, creating or strengthening community ties, is something that occurs more throughout the process. The purpose of this objective is to create a more resilient community with a strong network of connections and a sense of identity held by the community and location (Cheung et al., 2022; Masterson et al., 2017; Simms, 2016). Seaside, like many coastal towns, has a population that fluctuates and has a high rate of seasonal and temporary visitors. This means that establishing a sense of place and a sense of community is even more important because there is less time to cultivate a sense of

place in visitors or seasonal residents. For example, involving local groups, such as the Seaside

Downtown Development Association (SDDA), can help strengthen the community organization

and allows the programmer to utilize their networks within the community and possibly also

their personnel (SDDA, n.d.).

An art program can also attempt to create stronger links between different groups in the

community such as seniors and children. One way to do this is to create a school program that

connects school children to seniors who live nearby and may benefit from help in the case of a

tsunami event. Children could create preparedness kits, complete with flashlights, radios,

toiletries, first aid kits, and directions on how to prepare enough food and water to supply people

for 2-3 days; learn to check on seniors in the case of an evacuation; or make white scarves for

people who need help evacuating to hang on their doors (City of Seaside, n.d.-b). It would be

best if this program were developed through collaboration between these two groups so that they

have a greater chance to get to know each other and form connections.

Success for this objective would mean that members and organizations within the

community are well-connected and invested in the well-being of the city. In tandem with

previous objectives, questions could be added to community and user surveys given before and

after the program. The goal of those questions would be to assess if people feel well-connected

to the community. If the programmer can make new ties within the community by forging links

between people or organizations that did not previously exist, that can be additional anecdotal

evidence of success.

Conclusion

Oregon faces an increasingly severe risk of a catastrophic tsunami, and the low elevation of Seaside, OR puts it at higher risk. Existing tsunami education and wayfinding in Seaside is limited in the methods it uses to communicate tsunami risk and evacuation with the community. This project suggested introducing public art as a tool to supplement these existing tsunami education and wayfinding methods. In particular, I developed a cultural program process organized in two parts: *needs and evaluation frameworks*. This process has as a main objective of community participation focused on strengthening community ties through the creation of public art for disaster mitigation. The expected outcomes of the program are to raise awareness of tsunami risk and evacuation, to identify or create tsunami evacuation routes and landmarks, and to communicate decision-making strategies during evacuation. By going through this process, Seaside would be able to create a cultural program that uses public art to aid in education and wayfinding.

The needs framework aims to assess the needs and resources within the community to inform the creation of a program. This results in a final implementation that helps fulfill the needs of the community, supports the community, and fits with the local character. First, the needs framework guides the programmer to establish the target population by determining which people have the greatest need or would receive the most benefit. Second, the programmer has to assess locational needs through a process of community engagement. Doing so ensures that the program benefits the community rather than drawing ire and being unwanted. Third, the programmer needs to assess local resources—physical, labor, and monetary— to make sure the final product can help both create and strengthen community ties and supplement the existing identity of the area. Lastly, once the programmer has decided on target groups, identified

community or locational needs, and assessed local resources, they can begin to craft an implementable program.

The implementable program created through the needs framework is then further refined via the evaluation framework. The evaluation framework uses five objectives to determine the success of the program throughout the process and allows the programmer to identify weaknesses and make changes to make the program process and final product more successful. First, raising awareness of tsunami risk and evacuation aims to educate people about and draw attention to tsunami risk, indicators, evacuation, and resources so that in the case of a tsunami event, more people will respond fast and correctly. Second, identifying tsunami evacuation routes aims to make evacuation routes clearer, especially where it is less intuitive. Third, identifying or creating landmarks aims to establish landmarks—both beacons and cues— to assist with wayfinding during a tsunami. Fourth, communicating decision-making strategies during evacuation aims to impart proper decision-making strategies that will create more adaptive citizens that can successfully evacuate even under changing conditions and stress. Fifth, and last, creating or strengthening community ties aims to ensure that the process of creating a cultural plan for Seaside is also designed to create a more resilient community with a strong network of connections and a sense of identity.

This paper is limited to providing a framework for program design. All the examples provided are meant to be illustrative of the multiple possibilities and creative directions. A crucial part of the framework suggested is community participation and involvement. Developing a program through this framework could be a large endeavor, requiring a lot of community outreach and involvement, preferably on a city-wide scale. However, smaller programs could test the concept first, before investing in a larger-scale program.

Tsunami risk is ever present along the Oregon Coast and threatens to eventually cause major problems for many coastal communities such as Seaside. Using public art and a constructive approach to helping people know more about tsunamis and evacuation mitigates some of the panic and stress associated with natural disaster risk. Using the framework suggested in this paper to develop an art program has the potential to make tsunami risk more visible, the community more resilient, and people more supported in the evacuation process.

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