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Patrick J. Copeland for the degree of Master of Science in Geography presented on April 29, 2020

Title: In the Wake of Cascadia: Overcoming the Challenges of Disaster Preparedness for the Visiting Population in Newport, Oregon

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Extensive research has been published on a large-scale Cascadia subduction zone (CSZ) rupture off the Oregon coast, including the requirements of evacuation, shelter, and mass care of a diverse coastal population due to earthquake and tsunami related hazards. Adequate preparedness centers around the understanding of a hazards characteristics, and the capacity to respond of the population and the systems which support it. This research explores the capacity to respond for Newport, Oregon given a visiting population that is plausibly unprepared, and at times reaching upwards of three times the local population. Through the examination of city, county, state, and federal preparedness documents, and interviews with city, county, and state stakeholders, this research proposes recommendations to reduce the vulnerability in Newport's visiting population and increase the capacity of the community of Newport to respond to a future CSZ rupture. These recommendations include first prioritizing Newport's preparation effort, for (1) successful evacuation of the inundation zone, (2) providing shelter and mass care for 30 days, and (3) transporting the visiting population out of the community. Second, educating the visiting population on preparedness, while simultaneously building a response capacity with waterfront businesses and their employees. Finally, utilizing the city's schools as relief centers, as this may help both response and recovery.

In the Wake of Cascadia: Overcoming the Challenges of Disaster Preparedness for the Visiting
Population in Newport, Oregon

by
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Dean of the Graduate School

I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

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Patrick J. Copeland, Author

ACKNOWLEDGEMENTS

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CHAPTER 1 – INTRODUCTION

RESEARCH QUESTION

What are the anticipated challenges of disaster response and recovery pertaining to the visiting population in Newport, Oregon during a Cascadia subduction zone rupture, and what plans or preparations can be instituted to mitigate or overcome these challenges?

HOW WE GOT HERE: HISTORY OF CSZ PREPAREDNESS FOR OREGON

To fully comprehend the "Big One", or a full-scale Cascadia subduction zone (CSZ) rupture, it is vital to go back to January 26, 1700, the last time this natural hazard occurred. Depending upon your location along the Pacific Rim, your recollection of the event would vary. In Japan, samurai, merchants, and peasants all wrote about a tsunami that arrived with no warning, flooding their coastal shores. Consequently, they named this event the orphan tsunami, or a tsunami without an earthquake (Atwater et al., 2015; Yeats, 2004). In Northern California, the Yurok people told of when Earthquake ran up and down the coast shaking the ground and causing it to fall into the ocean. In Washington, the Quileute and Hoh people spoke of a terrible fight between Thunderbird and Whale, in which the ocean rose up and flooded the land. While on Vancouver Island, a person kicked over a dwarf's drum and got earthquake-foot, causing the ground to shake with every step and "everything then drifted away" (Finkbeiner, 2015).

The oral traditions of the many indigenous people from the Pacific Northwest are instrumental in piecing together the history of the CSZ. However, it was not until three centuries later that geologist determined the actual cause of the ground shaking on that night, and were finally able to link Japan's orphan tsunami an earthquake. Now, research suggests that on January 26, 1700, at approximately 9:00 P.M., the North American plate broke free of the subducting Juan de Fuca plate in a moment magnitude (M_W) 9.0 earthquake. The result was violent shaking and the displacing of water along hundreds of kilometers, launching both local and distant tsunami waves (Atwater et al. 2015; Finkbeiner, 2015).

Today, the CSZ has a documented 10,000-year paleo seismic earthquake history, which suggests that it has ruptured 40 times prior to the last event in 1700 (Goldfinger et al. 2012). While we may have access to this information today, through the examination of the sequence of events in Figure 1.1, it is evident that the current documented knowledge of the hazard postdates the growth and development of infrastructure, which currently comprises and serves as lifelines for Oregon's coastal communities.

Though the last rupture occurred in 1700, the only known written evidence of the event was recorded in Japan (Atwater et al., 2015). Because the Pacific Northwest was the last portion of the Pacific rim to "receive settlers willing to record their history" (Yeats, 2004), it was not until the 1800s that a detailed written record was established for the region, and not until the 1980s that both the orphan tsunami and the oral traditions were connected to a CSZ rupture (Yeats, 2004).

In 1983, John Adams of the Geologic Survey of Canada discovered that the roads in the Oregon coast range were moving as if the earth's crust was under immense strain (Yeats, 2004). In 1984, Tome Heaton and Hiroo Kanamori from the California Institute of Technology compared the CSZ to other subduction zones around the world and suggested that it may be completely locked (Heaton and Kanamori, 1984). In 1986, Brian Atwater of the United States Geologic Survey hypothesized that the coast of the Pacific Northwest may have dropped into the ocean instantaneously (Atwater, 1987). Finally, in 1987 at the Oregon Academy of Sciences meeting, scientists finally agreed that a future CSZ rupture was looming (Yeats, 2004).
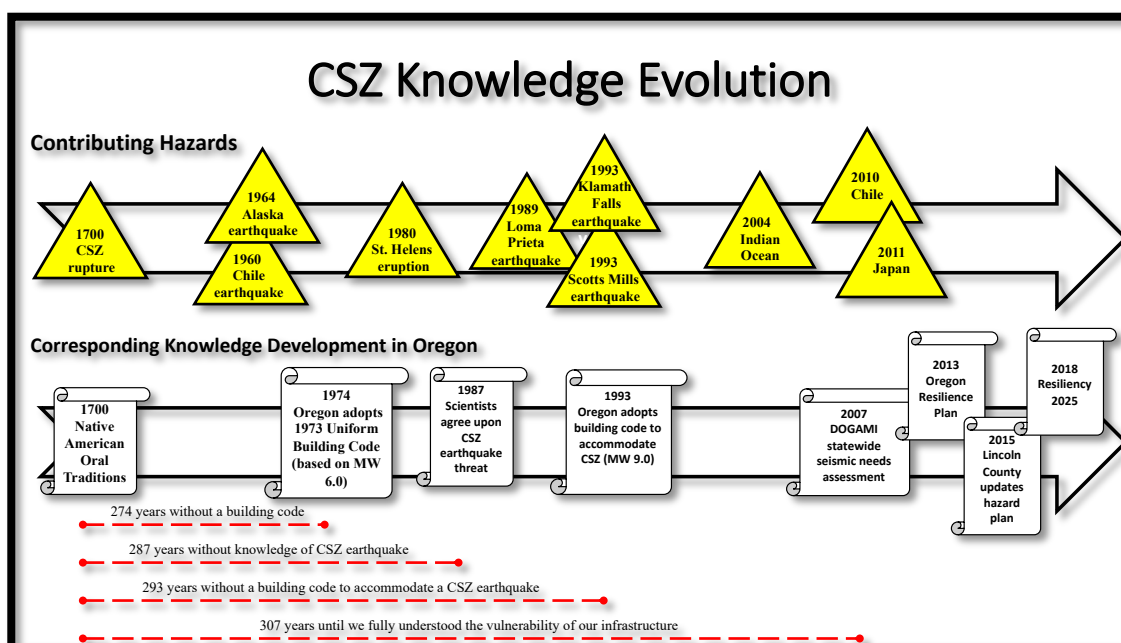
Figure 1.1. Timeline overlaying CSZ related hazards with demonstrated knowledge and commitment in the state of Oregon. Figure created by the author with information compiled from (Atwater, 1987; Atwater et al., 2015; Brown and Harryman, 2018; Building Codes Division, 2012; Goldfinger et al., 2012; Heaton and Kanamori, 1984; OSSPAC, 2013; Yeats, 2004;)

This means from 1700 to 1987, the Oregon coast evolved, and was consequently developed, without the knowledge or experience of this large infrequent hazard. To put this in perspective, the first statewide building code for Oregon was passed in 1974, with a M_W 6.0 earthquake in mind, not the M_W 8.0 or greater the CSZ can produce (Building Codes Division, 2012; Yeats, 2004). For reference, the moment magnitude scale is a logarithmic scale, and a M_W 8.0 releases 1,000 times more energy than a M_W 6.0. It was not until 1993 that Oregon's building code took into account a CSZ rupture, and not until 2007, following the publishing of Oregon's Department of Geology and Mineral Industries' (DOGAMI) *Statewide Seismic Needs Assessment,* that Oregon fully understood the vulnerability of its infrastructure (Lewis, 2007; OSSPAC, 2013). "The core of our vulnerability to a Cascadia earthquake is not the earthquake alone, but the inadequacy of our built environment" (OSSPAC, 2013, p. 13).

In reality, as asserted in an interview with the A. Rizzo "Cascadia is a relatively new hazard. It took until 2004 with [the Sumatra-Andaman earthquake in] Indonesia and then again in

2011 with [the Tohoku earthquake in] Japan for the state to gain traction with decision makers. People were able to see it unfold in real time and witness the impact this event could have" (personal communication, August 8, 2019). Following these events, the state of Oregon published extensive literature and conducted widespread community outreach to ensure both the education of the disturbance and the commitment to mitigate and prepare for the impact were underway (Brown and Harryman, 2018; OSSPAC, 2013). Oregon published two resilience documents, *The Oregon Resilience Plan* in 2013 and *Resiliency 2025: Improving Our Readiness for the Cascadia Earthquake and Tsunami* in 2018. These documents outline the State's planning priorities, which aim to reduce the risk associated with legacy infrastructure and improve response and recovery. Lincoln County, Oregon followed suit with updates to their own emergency operations plan in 2015.

As I will discuss moving forward in this paper, the coping capacity, adaptive capacity, and overall resilience of a community is often tied to their experiences and lessons learned from past hazard events. Unfortunately, Oregon's coastal communities were not afforded this opportunity, at least not directly. Even with these recent real-world displays, there are still questions to be answered and challenges to be overcome in coastal community such as Newport. The difficulty lies in planning and preparing for a hazard you and your community have never experienced, and is compared to a major meteor strike in both probability and magnitude (R. Martinez, personal communication, January 4, 2019). This is the challenge Oregon coast emergency preparedness coordinator's such as Newport's Regina Martinez are facing on a daily basis.

NEWPORT: RESEARCH LOCATION, LIFELINES, AND SCALE

The city of Newport is the county seat of Lincoln County, and resides along Oregon's central coast at the intersection of United States Highway 101 and United States Highway 20, and straddles the Yaquina Bay. These highways, along with the Portland and Western Railroad,

connect Newport to the rest of the Oregon coast and the Willamette Valley, while the Yaquina

Bay links Newport and the State of Oregon to multiple Asian destination across the Pacific Ocean

(City of Newport, 2010). Additionally, the city maintains the Newport Municipal Airport, further

enhancing the community's ability to transport people and resources.
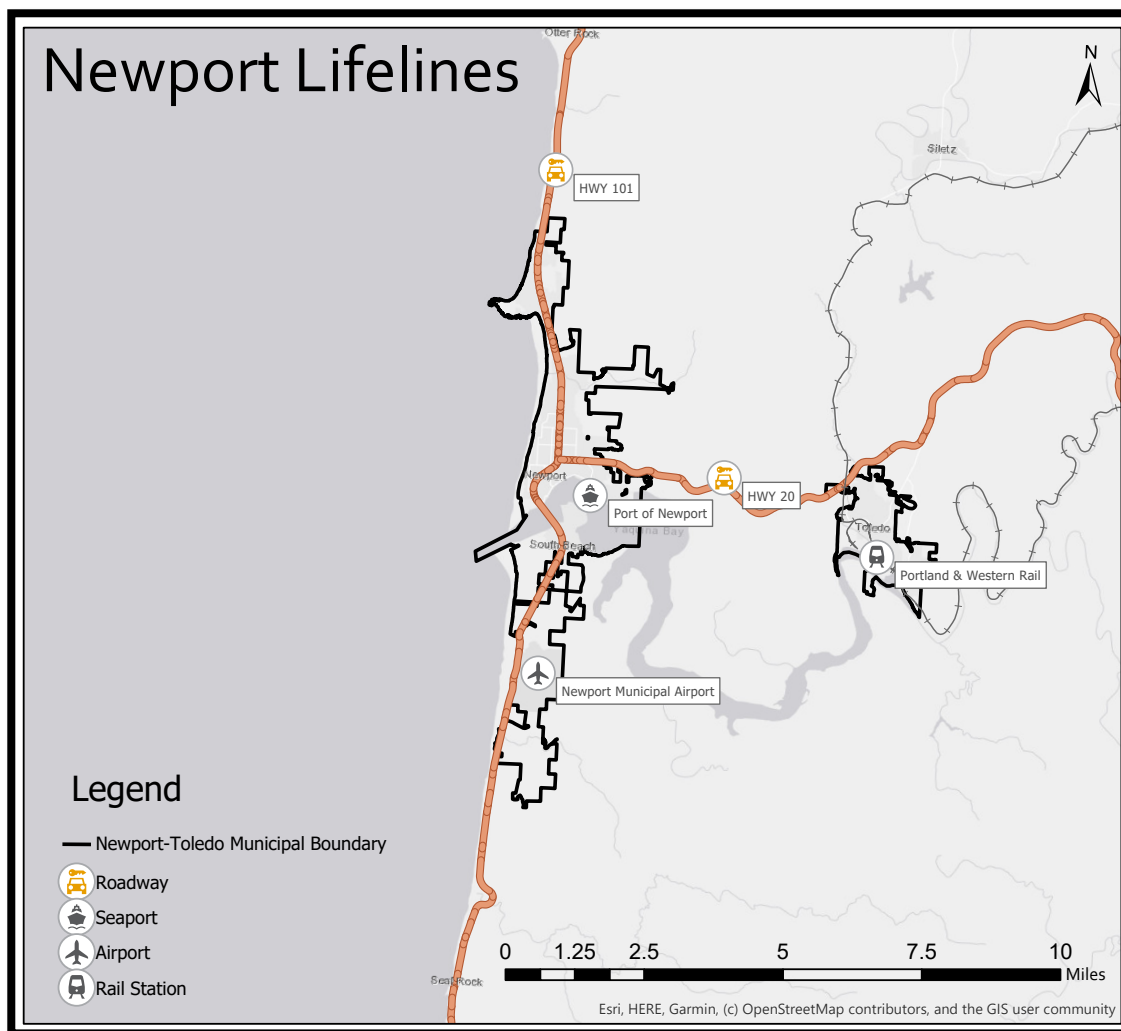
Figure 1.2. Map depicting primary lifelines for transporting people and goods between the
Newport-Toledo municipal area and the State of Oregon. Figure created by author with
information compiled from (City of Newport, 2010; OSSPAC, 2013).

At first glance (see Figure 1.2), Newport appears to be well connected for disaster

response and recovery in the face of a any hazard. However, when expanding the aperture, it is

readily apparent that anticipated lifeline degradation, and the dichotomy of scale, present unique

resource challenges across local, state, and federal echelons for emergency response and recovery.

First, lifelines are defined as "systems or networks which provide for the circulation of people, goods, services, and information upon which health, safety, comfort, and economic activity depend" (Platt, 1991, p. 173). "Lifelines and their supporting infrastructure include roads and bridges, rail lines, airports, port facilities, electrical power transmissions, water and wastewater systems, petroleum and natural gas pipelines, and communication systems" (Thompson, 2010, p. 301). As mentioned, Oregon's legacy infrastructure is extremely vulnerable to the shaking a CSZ rupture may produce. Consequently, Newport's current lifelines are vulnerable to severe degradation. Oregon's Office of Emergency Management (OEM) and local emergency managers expect it to take two weeks to 30 days for rescue and relief to arrive, simply due to the inability of responders to reach the coast (A. Rizzo, personal communication, August 8, 2019; V. Demaris, personal communication July 22, 2019; R. Martinez, personal communication, January 4, 2019). Figure 1.3 provides a visualization of how expected lifeline degradation will isolate certain areas of the Oregon coast, thus illustrating the concern of emergency managers.

Figure 1.3. Map depicts anticipated "islands" from a M_W 9.0 CSZ rupture. Due to expected landslides, liquefaction, and damage to transportation infrastructure, coastal communities such as Newport, OR may become geographically isolated "islands" (Cascadia Island Mapping, 2016).

Historic earthquakes in similar mountainous regions reveal how easily entire valleys can become isolated due to seismic events. Kashmir, Pakistan experienced an earthquake in 2005, and United States military air support was required to support rescue and relief as roads running along valley floors were rendered impassible (Thompson, 2010). Reduction of these lifelines inhibits a community's ability to communicate to responders, and then inhibits the ability of responders to reach the community (Thompson, 2010). This is not a formidable issue when U.S. Highway 20 is temporarily blocked by a single landslide, as resource coordination can re-establish the route within days and rerouting traffic only causes an inconvenience of a few hours. However, the scale

of the CSZ means this simple exercise must be executed on presumably every east-west route connecting the Willamette Valley to the coast.

This brings about the contrast of scale. The CSZ extends from northern California to southern British Columbia. The inundation zone directly impacts two countries, three states, one Canadian province, seven Oregon counties, and six cities in Lincoln county alone, not to mention the populated areas between municipalities. This makes Newport one of many potentially isolated communities. With a small tax base of approximately 10,680 residents (https://www.census.gov/quickfacts/newportcityoregon), it is also a challenge to access and compile the resources necessary to take adequate mitigating actions prior to the event, and then execute independent rescue and relief efforts after the event. This discrepancy of scale presents challenges in the prioritization of resources from county, state, and federal emergency planners.

Newport's resilience is critical not only to the community itself, but to all of Oregon. Due to lifeline degradation, which will hinder both the transportation of people and resources, the state of Oregon expects the only way to reach coastal communities after a major CSZ event will be by sea or air. Newport contains one of five deep-water ports in Oregon (Brennan, 2008), and the Newport Municipal Airport is one of seven coastal airports located outside the tsunami inundation zone (OSSPAC, 2013). While not the focus of this paper, it may take the coast years to fully recover, which can have dire economic consequences for the state and beyond (OSSPAC, 2013). Newport is proclaimed the "Dungeness Crab Capital of the World" (https://discovernewport.com/about), due to the record numbers of commercial crab harvest. Disaster preparation in Newport may help restore these lifelines in an efficient fashion, which could aid response efforts to both Newport and the greater Oregon coast. Additionally, efficient response and the use of these lifelines may aid in a timely recovery, enabling the local population to plug back into the coastal economy.

All disasters start local (FEMA, 2020), and through this examination of Newport's strategic situation on the Oregon coast, it is evident how and why a local disaster can impact county, state, and federal echelons. This is why preparedness is not an isolated effort, but one which incorporates vertical and horizontal coordination (FEMA, 2010). However, effective coordination is seated in the ability of a local jurisdiction to understand the characteristics of the hazard, specifically how it will intersect the community, and the corresponding vulnerability or capacity to respond of both the populations within the community, and the systems, or lifelines, which support those populations. This understanding enables each jurisdiction to recognize what capacity it has, and what capacity it needs to effectively respond and recover. This research aims to help Newport identify what capacity it has to respond to a CSZ event given its vast and diverse visiting population.

SIGNIFICANCE OF RESEARCH

On March 11, 2011 Japan was struck with a M_W 9.0 subduction zone earthquake and tsunami and the results were catastrophic. In October of 2011, Japan reported 15,821 deaths, 3,962 people still missing, over 350,000 displaced personnel, and total damages estimated at 25 trillion yen (300 billion US dollars in 2011) (Dunbar, Mccullough, Mungov, Varner, and Stroker., 2011; Mimura, Yasuhara, Kawagoe, Yokoki, and Kazama, 2011). Unfortunately, "Oregon is a geologic mirror image of northern Japan" and the current understanding of the CSZ places a similar large subduction zone earthquake in Oregon's future (OSSPAC, 2013, p. 3). If Japan was considered one of the most earthquake and tsunami prepared countries in the world (Dunbar et al., 2011), then where does that leave Oregon?

According to a Cascadia Lifelines Program interview with S. Ashford, the Kearney Dean of Engineering at Oregon State University and a governing board member of the Oregon Department of Geology and Mineral Industries (DOGAMI), "The expected earthquake [and subsequent tsunami] on the Cascadia subduction zone is going to be the single largest natural

disaster ever to face the United States" (Ashford, 2016). If such an event occurred today, thousands of people would lose their lives and the estimated cost of damage would exceed $32 billion dollars. The vast number of individuals who survive the initial earthquake and tsunami may have to wait weeks until rescue and relief arrives. For coastal communities that experience inundation, such as Newport, Oregon, it may take years to fully recover (OSSPAC, 2013).

The problem for Newport goes beyond the fact that it occupies the tsunami inundation zone, but that the community attracts a large visiting population into a potentially catastrophic hazard area. Research suggests visitors to a community are a vulnerable population throughout all phases of the emergency management process: mitigation, preparedness, response, and recovery (Rivera and Kapucu, 2015). This is particularly important for Newport, as the visiting population can outnumber the local population from June through September. During this period, the gross population of the community can increase from ten thousand to over thirty thousand on a given day (R. Martinez, personal communication, January 4, 2019). With this in mind, "if a population is forecast to increase substantially, a community's capacity to provide adequate housing, services, or resources to all populations post-disaster may be stressed or compromised" (State Interagency Hazard Mitigation Team, 2015, p. 296). Thus, if not adequately prepared, the community may not have the resources to evacuate, shelter, and provide mass care for locals and visitors following a CSZ rupture.

As an active duty officer with the United States Army, I have witnessed, and been part of, the activation of the military in response to disasters. While not their primary mission, the military is routinely called to assist in providing humanitarian aid following these events. This is not because communities are not capable, they are simply unprepared and under resourced, and the military is fundamentally organized, trained, and resourced to operate in "unknown, . . . unknowable and constantly changing" environments (U.S. Army Training and Doctrine Command, 2014, p. iii). The same environmental characteristics exist in many disaster scenarios.

While the military model may not be directly translatable to Newport, the military model of constructing a plan and making preparations with inherent flexibility and adaptability, may be useful.

For Newport, the future CSZ rupture cannot be prevented (OSSPAC, 2013), but local emergency operation systems can be evaluated in order to improve their response capacity and reduce the impact of the event, improving the overall resilience of the community. Current literature provides extensive information on the potential characteristics of a CSZ rupture, and the importance of communities identifying and addressing their vulnerable populations and the systems which support them. However, there is limited literature on the specific vulnerability of the Oregon coast's visiting population, and the systems coastal communities, such as Newport, may have to support them. The purpose of this research is to threefold: (1) to understand why the visiting population may be vulnerable in Newport, then (2) through an examination of Newport's current preparedness level, to identify challenges in disaster response pertaining to the visiting population, and lastly (3) to suggest ways in which Newport could overcome these challenges given the communities present capability. The end goal is to formulate suggestions which could simultaneously reduce the vulnerability of the visiting population, and increase the community's capacity to respond, and ultimately recover.

CHAPTER 2 - BACKGROUND ON DISASTER RISK REDUCTION

INTRODUCTION

In my opinion, there is nothing more geographic than a natural hazard and the disaster it helps create. Disasters fundamentally occur at the intersection of the natural world and the human landscape. Over time, hazard and disaster research has evolved from placing the responsibility for the disruption solely on nature, to gradually understanding that there is a myriad of human induced factors which may enhance or exacerbate the situation in a hazardous area (Montz and Tobin, 2011). This evolution has led to the development of terms such as risk, vulnerability, capacity, and resilience.

Any extensive literature review will yield various definitions and applications of each of these terms. Currently, Disaster Risk Reduction (DRR) research is working on developing and codifying its own vocabulary through the efforts of the United Nations Office for Disaster Risk Reduction (UNISDR), but terminology coherence is still being established (Staupe-Delgado, 2019). This review will not attempt to explain or trace this vocabulary journey or argue the validity of any specific definition. It will simply define these terms as they best apply to a CSZ rupture, the community of Newport, and its challenges in disaster preparation and response with a vast visiting population.

HOW A HAZARD BECOMES A DISASTER

First, there are several categories of hazards currently separated into natural (associated with natural processes), anthropogenic (induced predominantly by human activities and choices), or socionatural (associated with a combination of natural and anthropogenic factors) (UNISDR, 2017). This study will focus on natural hazards which "originate in the biosphere, lithosphere, hydrosphere or atmosphere (Alexander, 2000, p. 9), and more specifically a geological hazard (an earthquake) that is originating from internal earth processes (UNISDR, 2017). Cutter (2003, p. 439) defines hazards as "potential threats to people and the things they value [, arising] from the

intersection of human systems, natural processes, and technological systems". In contrast, disasters are "normally singular large scale, high impact events. They are different than hazards . . . [and] are an outcome of . . . the hazard" (Cutter, 2003, p. 439-440).

The United Nations (UN) defines a hazard as "a process phenomenon or human activity that may cause loss of life, injury or . . . property damage, social and economic disruption or environmental degradation" (UNISDR, 2017, p. 18). However, "unlike hazard and risk, a disaster is an actual happening" (Smith, 2013, p. 12) and the consequence is a "serious disruption of the functioning of a community or a society at any scale . . . [and] the effect may test or exceed the capacity of a community or society to cope using its own resources" (UNISDR, 2017, p. 13).

Consequently, a hazard can exist independently with a potential for risk, but a disaster is a social construct, and can only occur when the hazard intersects the human landscape and causes socio-economic disruption. Of importance in the characterization of a disaster, is the concept that the unit declaring the disaster cannot execute rescue, relief, and recovery operations without assistance from neighboring jurisdictions. Therefore, disaster response and recovery require not only the securing, transport, and delivery of resources, but multijurisdictional coordination.

The capability of a hazard to lead to a disaster is connected to its characteristics. The UN outlined the characteristics of a hazard as location, magnitude, frequency, and probability (UNISDR, 2017), but I prefer those outlined by Burton, Kates, and White (1993) for application to the CSZ, even if they may be slightly dated. Their characteristics are classified as magnitude, spatial extent, speed of onset, recurrence interval, future probability, and duration. Magnitude and spatial extent describe the strength of force and distribution of the event. Speed of onset refers to the length of time between event appearance and peak magnitude, while duration refers to the length of time that the event persists. Recurrence interval refers to frequency, or how often the event will occur over a period of time, and future probability is a prediction of if and when the event will occur.

The characteristics of a CSZ rupture outlined above combine to produce potentially catastrophic results. The M_W 8 or M_W 9 earthquake can cause extensive ground failure, destroying buildings and transportation networks along the Oregon coast, not to mention create a tsunami inundation zone with expected near total destruction of infrastructure (OSSPAC, 2013). The speed of onset will be immediate for ground shaking, and approximately 15-30 minutes for the first tsunami wave to reach Newport (Myers, Baptista, and Priest, 1999), making warning systems less effective. However, the duration of the hazard event is the real challenge, and the most significant to Newport's visiting population. While the earthquake itself will only last minutes, coastal communities such as Newport may have to wait weeks for rescue and relief to arrive due to anticipated isolation (Cascadia Island Mapping, 2016). Therefore, the real challenge is "keeping the population sheltered, fed and healthy" (OSSPAC, 2013, p. 7). This sequence of events could even be classified as a multi-hazard (UNISDR, 2017), as one hazardous event, the initial rupture, has cascading or cumulative impacts leading to the resulting geographic isolation and potential depletion of life saving and life sustaining resources.

While the aforementioned characteristics affect the ability to mitigate the effects of the hazard and respond in a timely manner, both recurrence intervals and future probability make it difficult to facilitate cooperation for community preparedness. With the last CSZ rupture occurring in 1700, and a recurrence interval of 300 to 600 years (Goldfinger et al., 2012), no one currently living in the Pacific Northwest has ever experienced an event like this. Further, with a 10 to 12 percent chance of a M_W 9.0 event or a 37-42 percent chance of a M_W 8.0 happening in the next 50 years (Goldfinger et al., 2012), there is a possibility they never will. This combination of sheer hazard size and daily uncertainty can make mitigation, preparedness, response, and recovery challenging for any community.

Research has routinely suggested that "personal experience with hazards influences perception and consequently human behavior" (Montz and Tobin, 2011, p. 2). Burton et al.

(1993) argued that there are three elements to this situation: recognize the hazard, consider how to deal with it, and make a choice from the options available. They further contend that the response, or choice made, is based upon an individual's awareness of the opportunities and perception of the risk. Expanding this model to the community offers the question of what perception of risk is associated with a large visiting population, and what opportunities are there to mitigate this risk in Newport.

DISASTER RISK

The first question that arises with the analysis of risk, is risk of what? The UN defines disaster risk as "the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society, or a community in a specific period of time, determined probabilistically as a function of hazard exposure, vulnerability, and capacity" (UNISDR, 2017, p. 14). The UNISDR also makes note to ensure communities understand "that people do not necessarily share the same perceptions of risk and their underlying risk factors" (2017, p.14). As previously discussed, risk is a composite function of the choices, often driven by risk perception, a community makes as it inhabits a hazard prone landscape (Wood, 2011).

Simplified, risk is the combination of the probability of the hazardous event and its negative consequences (Alexander, 2000; Smith, 2013). Therefore, there are characteristics of a hazard, and varying levels of vulnerability and capacity of the people, community, and systems upon which they intersect that can reduce or exacerbate risk. Negative consequences often occur due to a lack of resources, because resources expand the capacity of individuals, and groups, to cope and or adapt. This is why people in poorer less developed countries are often at greater risk to hazards (Smith, 2013). Resources can increase the ability to mitigate the effects of a hazard, improve preparation efforts, and increase the capacity to successfully respond to the event (Wood, 2011). Consequently, access to adequate resource can impact exposure, reduce sensitivity, increase both coping and adaptive capacity, and reduce the overall risk.

Dissecting this composite for Newport, a visiting population's risk is centered around injury or loss of life during the event, and possibly limited access to shelter, sustenance, and healthcare following the event. This translates to Newport's emergency operations plan, as an increased population, especially one not prepared for an extended stay, requires greater resources to support. With lifeline degradation, it may take weeks for outside resources to arrive, therefore adequate resource preparation within the community prior to the event could mitigate future community resource depletion and reduce aggregate risk.

VULNERABILITY

The literature on vulnerability reveals multiple definitions centered around places, individual people, social and economic systems, and structures in general. While there may not be a common agreement on the term, "vulnerability, [can be] broadly defined as the potential for loss" (Cutter, 1996, p. 529) or the "propensity or predisposition to be adversely affected" (Drejza et al., 2019, p. 180). The UNISDR defines vulnerability as "the conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets or system to the impacts of hazards" (2017, p. 24). I believe this definition is fitting as it acknowledges that vulnerability is not a direct result of hazard exposure, nor simply the product of the social or economic situation, but a contribution of multiple variables.

Cutter's hazard of place model of vulnerability (HOP) captures the interaction of these variables, which are separated into "vulnerability as risk / hazard exposure; vulnerability as social response; and vulnerability of places" (Cutter, 1996, p. 530). Cutter developed the HOP model to depict the interaction of all three themes contributing to the vulnerability of an individual or group in a specific place (Cutter, 1996). The first theme explains vulnerability through exposure to a hazard. The second theme focuses on the "social construct of vulnerability . . . rooted in historical, cultural social and economic processes that impinge on the individual's or society's

ability to cope . . . and respond" (Cutter, 1996, p. 533) to disasters. Finally, the third theme "can be geographic space, where vulnerable people or places are located, or social space, who in those places are most vulnerable" (Cutter, 1996, p. 533).

Just as there are characteristics of a hazard which affect risk, there are characteristics of a person or components of a community's system which can impact its vulnerability (Cutter, 2013; Wood, 2011). These components can be categorized into ecosystem goods and services, cultural assets, infrastructure and facilities, land use and development, economy, and population (Wood, 2011). The exposure, sensitivity, and capacity to cope or adapt of these components determine vulnerability (Wood, 2007/2011).

The natural processes which produce the chronic or catastrophic event can also provide a good or service that attracts people and settlement. For coastal communities such as Newport, the areas with the worst geologic problems are also the areas that are the most desirable for development (Schlicker, Deacon, Olcott, and Beaulieu, 1973). "Port and harbor facilities and businesses must, by definition, occupy waterfront properties that are typically highly susceptible to earthquake and tsunami hazards" (Wood and Good, 2004, p. 245). This leads to theme one, hazard exposure. Furthermore, when this resource becomes imbedded in the community culture and economy, in this case a working waterfront (Greater Newport Area Vision, 2017), the strategy of "open space preservation" (Wood and Good, 2004, p. 245) for tsunami mitigation becomes more difficult. So, while the intersection of the hazard and the community is fundamentally complex, a tourist-driven coastal economy exacerbates the issue by attracting thousands of people into the hazard zone on a daily basis, and thus complicating theme two, the social construct. Add to this the aforementioned lifeline degradation, and all three themes outlined in the HOP model intersect to produce a vulnerable visiting population within a vulnerable geographic space.

Vulnerability of Visiting Populations

First, I should define the term "visitor". My research originated with a focus on tourists, but as I progressed, I realized the tourist is only one of multiple groups of people which may temporarily find themselves within the community of Newport. For example, how do you classify a businessperson who arrives in town for a meeting, but walks down to the beach during lunch to see the ocean? Therefore, a visitor is anyone who is not a resident, and who may temporarily find themselves within the city limits no matter their purpose. They may be visiting for the day, spending the night, or simply passing through on their way to another destination. I recognize there are vacation homeowners who could be classified as both resident and visitor due to their property ownership, but for my purposes I will designate them as a visitor, as the majority of their time is spent outside the community. I also understand that there is a seasonal work force. While they are not the focus of this paper, I do believe some of the discussion and recommendations may be applicable to this population.

Vulnerability research has traditionally targeted developing regions of the world (Wisner, 2013) and focused on the social and economic characteristics that increase hazard risk (Morrow, 1999). Arguments are routinely made that in these locations there is "unequal access to opportunities and unequal exposure to risk which are a consequence of the socio-economic system" (Cannon, 1994, p. 14-15). While this paper will not attempt to further research in the socio-economic disparity of some populations that exacerbates their vulnerability, it will attempt to connect the characteristics of these previously classified vulnerable populations to the visiting population in Newport.

Morrow (1999) argues that vulnerability can be connected to personal resources such as education, social resources such as networks, and political resources such as a person or groups relation to community decision makers. While not necessarily a product of their economic position, these traits can be associated to a visitor's social position within the community. Visitors

are likely not directly connected to policy makers or part of the disaster planning and preparation process in the community they visit. Additionally, they potentially have little knowledge of the hazard or the community plan, and may have limited social connections to access the resources required for prolonged shelter. Consequently, the visitor in Newport is predominantly dependent on the community during and after the event (Wood and Good, 2004).

Further aggravating the basic characteristics of vulnerable populations, visitors in general offer other unique challenges to a community during a CSZ rupture. First, visitors "are mobile, difficult to account for and not easy to reach with relevant information" (Becken and Hughey, 2013, p.78). Add these characteristics to the fact that the majority of Newport visitors are day travelers (Wood and Good, 2004), and the problem only increases. Second, visitors are usually traveling in unfamiliar environments without efficient connections to the local community. Finally, in addition to their social isolation, visitors on vacation have a predisposition towards a positive experience, which may diminish their capacity to absorb and comprehend hazard related information (Jeuring and Becken, 2011; World Tourism Organziation, 1998).

 Risk reduction is centered on the intersection of the hazard and the vulnerable system (Wisner, 2013; Wood, 2007), and a vulnerable population within a community can strain the communities' resources and services. In the case of Newport, the visiting population, through no fault of their own, has the possibility of straining essential services and depleting critical resources. This could potentially cause adverse effects on the ability of the community to respond to other populations, and efficiently restore necessary services for the wellbeing of the community as a whole. Lacking any immediate support network, these visitors may be reliant on the ability of Newport residents to facilitate their evacuation from the tsunami inundation zone and support them with resources for food, shelter, and medical services until they leave the area (Wood and Good, 2004). A prepared Newport could be better equipped to respond to an

expansive visiting population, thus simultaneously building resilience in both the visiting
population and the community as a whole.

CAPACITY, RESILIENCE, AND SUSTAINABILILITY

The term sustainability is often associated with the term resilience. The UNISDR (2017,
p. 22) defines resilience as "the ability of a system, community, or society exposed to hazards to
resist, absorb, accommodate, adapt to, transform from the effects of a hazard in a timely and
efficient manner, including through the preservation and restoration of its essential basic
structures and functions through risk management". Cutter (2013, p. 73), through her work on
developing disaster sustainable communities, defines sustainability as the "means that a locality
can tolerate - and overcome – damage, diminished productivity, and reduced quality of life from
an extreme event without significant outside assistance". Therefore, a community or a person in a
community, is resilient, or displays sustainability, if they can successfully preserve or restore their
basic functions and structures in a timely manner without outside intervention.

Capacity is a term often associated with both vulnerability and resilience. Lacking the
capacity to cope or adapt can be associated with increased vulnerability (Wisner, 2013), while on
the other hand having the capacity to cope or adapt can be associated with increased resilience
(Cutter, 2013). The literature is inundated with opinions on whether vulnerability and resilience
are opposites or components of each other (Manyena, 2006). I do not intend to add to this
argument, but simply agree that building the capacity of a person, system, or community can
decrease its vulnerability and or simultaneously increase its resilience to a hazard. As stated by
the UNISDR (2017, p. 12) capacity is "the combination of all the strengths, attributes and
resources available within an organization, community or society to manage and reduce disaster
risks and strengthen resilience".

Capacity can be further broken down into coping capacity (Turner et al., 2003), adaptive
capacity (Adger, 2006), or simply the capacity of response (Gallopin, 2006). Coping capacity has

been linked to short-term extreme events, focusing on the ability to simply protect and conserve

the current population and systems (Palovitta, Kortetmaki, Puupponen, and Silvasti, 2017; Smit

and Wandel, 2006;). On the other hand, adaptive capacity has been linked to long-term process of

learning and implementing sustainable change (Palovitta et al., 2017; Smit and Wandel, 2006.

Gallopin combined both terms, generally defining the concept as the capacity of response, and

argues that it "is clearly an attribute of the system that exists prior to the perturbation" (2006 p.

296). I prefer the term capacity of response, as well as Gallopin's definition, and will use it going

forward

The ability to learn from and adapt following previous hazards has long been a key

component of hazard and disaster literature (Burton et al, 1993). Long recurrence intervals can

inhibit this adaptation from occurring, as can the lack of access to requisite resources. Both of

these challenges are presenting themselves along the CSZ. Additionally, the sheer magnitude of a

potential CSZ rupture make coping in itself a challenge. As mentioned by Burton et al. (1993) our

choices in the face of a hazard are based upon our awareness of the opportunities available. One

of the purposes of my research is to help Newport identify capacities of response within their

community, so they may be implemented into their emergency operations plan, and consequently

increase their resilience.

EVACUATING VISITORS DURING A DISASTER

While the thought of the mass evacuation of a group of people that mirrors or exceeds the

community's local population may seem unreasonable, research suggests it is feasible. Previous

studies propose that people can act orderly during a disaster displaying "controlled behavior,

order, and personal initiative (Quarantelli, 1986). In one study on the occupant evacuation of the

World Trade Center on September 11, 2001, first-hand accounts demonstrated that many

occupants used the time prior to evacuation to exchange information, gather personal items, call

family members, and help or search for other occupants in the building. One respondent in the

study even stated they went back upstairs to their floor after initially evacuating to see if anyone was left behind (Peacock, Averill, and Kuligowski, 2013). Furthermore, "[t]wenty percent of survivors reported being helped by someone [,] thirty percent reported helping others", and over fifty percent of the help received was reported to be from co-workers in the buildings (Peacock et al., p. 16-17, 2013).

In addition to debunking the idea of mass chaos during a disaster, research has also suggested that the key populations in the development of a disaster management plan are the people who will implement the plan itself (Quarantelli, 1986; Drabek, 1995). This implies that the knowledge and resources are present in the local community, hence alleviating the need to educate and recruit assistance from a perpetually changing visiting population. Additionally, a relatively functioning system for disaster management already exists, and tourism-based communities can benefit from applying the same systematic approach with their visiting population in mind (Becken and Hughey, 2013).

Previous research on disaster management within tourism has focused on bridging the gap between emergency management and the tourism industry. Drabek (1991/1995) focused on the necessity of community partnerships between emergency managers and tourist industry representatives in both plan making and implementation. He even advocated for disaster management in university curricula involving tourism, travel, and hotel administration. Faulkner (2001; Faulkner and Vikulov 2001) established a six-phase tourism disaster framework focusing on crisis management in the tourism industry during a disaster. However, more recent publications identified that frameworks like Faulkner's were crisis management centric and did not reference associated emergency management literature (Becken and Hughey, 2013; Ritchie, 2008), such as the Federal Emergency Management Agency's (FEMA) emergency management cycle.
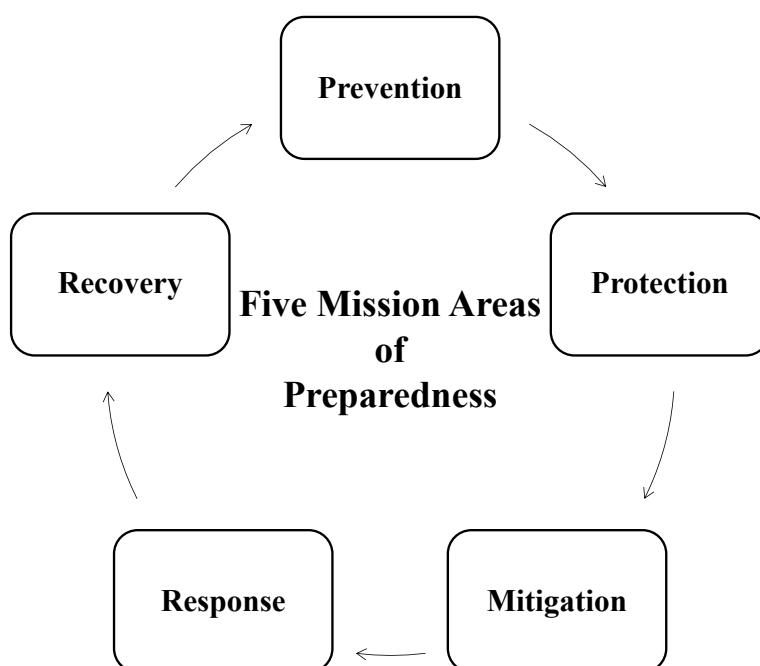
Figure 2.1. Five mission areas of FEMA's National Preparedness Goal. Figure created by author with information from (FEMA, 2010). Fitting disaster management for the visiting population into this framework may be more practical than developing a separate and distinct framework.

Focusing on this gap, Becken and Hughey (2013) proposed linking tourism to already established emergency management structures as opposed to developing separate structures solely for tourist populations. In towns with small businesses, such as Newport's waterfront (Greater Newport Area Vision, 2017), where owners and operators are the same, and vulnerability is increased due to a lack of time and resources to prepare for disasters, this is a potentially viable solution (Cioccioa and Michael, 2007). In this case, Newport already has an emergency operations plan built upon FEMA's framework of prevention, protection, mitigation, response, and recovery (https://www.fema.gov/national-planning-frameworks). With this in mind, the goal of this paper it to understand the current emergency operations plan, help Newport identify resources within the community that can increase the capacity to respond to a CSZ, and make suggestions with the implementation of these capacities to build both resilience in the visiting population and the community as a whole.

EMERGENCY MANAGEMENT FRAMEWORK

Throughout this literature review I referred to several terms more closely aligned with emergency management policy than disaster risk reduction literature. While academic theory is continuously evolving, so is the applied or practitioner aspect of emergency management. In essence, emergency management is where hazard and disaster theory is implemented. In the United States, FEMA is synonymous with hazard mitigation, disaster response, and emergency management. Fundamentally, a hazard is the event, a disaster is the intersection of the event with the human populace resulting in an impact on the socio-economic system, and the resulting state of an overwhelmed human populace in need of aid is an emergency.

FEMA, defines an emergency as "any occasion or instance for which, in the determination of the President, Federal assistance is needed to supplement state and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of catastrophe in any part of the United States" (Public Law 100-707). However, the Disaster Mitigation Act outlines that state, local, and tribal governments are required to develop and submit a hazard mitigation plan in order to receive federal aid (Public Law 106-390). Basically, the federal government is obligated to intervene if a local community cannot cope or adapt to a hazard and that jurisdiction has submitted a hazard mitigation plan.

FEMA uses the National Planning Framework (NPF) when managing emergencies, which consists of five preparedness mission areas: prevention, protection, mitigation, response, and recovery. These mission areas are similar to, and appear to have replaced, the previously defined emergency management cycle or disaster cycle (FEMA, 2010), although the general concepts of emergency or disaster management appear unaffected. The mission areas are not discrete, but overlap through all phases of community preparedness. Prevention, protection and mitigation all occur before and after the emergency event. Prevention is focused on avoiding or stopping a threatened or actual act. Protection focuses on securing people and communities

should a terrorist act or hazard occur. Mitigation focuses on reducing the impact of a hazard, specifically attempting to lessen the loss of life and property. Response occurs during an emergency, and includes actions taken to save lives, protect property and the environment, and meet basic human needs. Recovery occurs after the after the event, and includes actions taken to return to a normal or ideally safer situation following the event (https://www.fema.gov/mission-areas).

The mission areas of focus for this paper are mitigation and response. Specifically, what plans and preparations can be put in place to mitigate the impact of the hazard and improve the response capacity of the community? Understanding that the framework is continuous and overlapping, these efforts should in theory make for a more efficient recovery and ultimately preserve and restore the community's basic functions and structures (Cutter, 2013). Consequently, improving mitigation and increasing response capacity for the visiting population should make Newport more resilient.

BUILDING A CAPACITY TO RESPOND IN NEWPORT

Resilience in the Wake of Cascadia
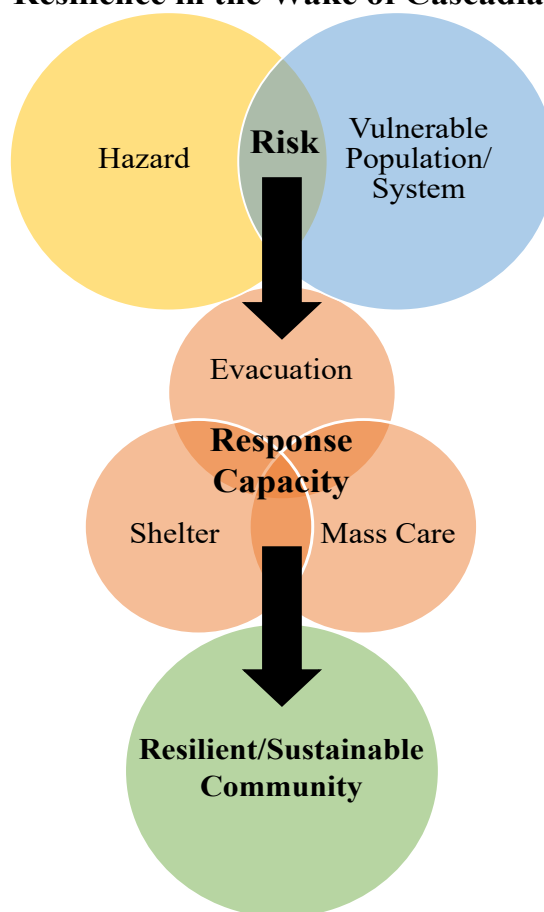
Figure 2.2. Generally, risk occurs at the intersection of the hazard and a vulnerable population or system. Specifically, risk in Newport for the visiting population centers on the potential inability to effectively evacuate, shelter, and provide mass care for themselves. Risk can be alleviated by reducing vulnerability, and or reducing exposure. For Newport, the reduction in vulnerability of their visiting population may be accomplished by finding a means to build the capacity to respond with respect to evacuation, shelter, and mass care. Figure created by author.

In essence, the situation in Newport presents the potential for a M_W 9.0 subduction zone earthquake, and subsequent tsunami, to intersect a plausibly vulnerable visiting population within the vulnerable working waterfront space. The characteristics of the hazard, and the current status of lifelines serving Newport, allude that the risk associated with this intersection could be alleviated by either keeping the visiting population out of the hazard zone, or reducing their

vulnerability by increasing their capacity to respond: a capacity to respond, which could in turn

increase the resilience or sustainability of the community as a whole

Given the time and resources necessary to improve statewide lifeline infrastructure,

Oregon has proposed a 50-year plan (OSSPAC, 2013), the preliminary capacity to respond ought

to be developed within the community and center on the ability to evacuate and then resource

shelter and mass care for an extended period. Further, if increasing the capacity to cope, adapt, or

ultimately respond, can increase overall resilience (Cutter, 2013), then Newport and its visitors

should have a joint stake in developing the knowledge and resources necessary to evacuate,

shelter, and provide mass care for the communities visiting population. To accomplish this, the

community can increase the ability of the visiting population to respond themselves, can facilitate

the desired response for its visitors, or can implement combination of both. Therefore, I focused

my research both on identifying the challenges with developing both of these capacities in

Newport, and for ways they can be cultivated given the knowledge and resources present within

the community.

CHAPTER 3 – RESEARCH METHODS

APPROACH AND OBJECTIVES

While my field work for this paper began in the summer of 2019, my journey of interest into the study of hazards and disasters originated in the Kunar Province of northeastern Afghanistan in October of 2012. Here, in the foothills of the Hindu Kush, I witnessed what my physical geography teacher so strongly emphasized to my class, "water always wins". A lone single lane concrete bridge, which traversed the Watapur River, connected the people of the Pech River valley and its five tributary valleys to the provincial capital of Asadabad. After several days of heavy rain, the bridge was gone. To us, this was catastrophic. Our entire mission relied on the flow of supplies across that bridge. However, the local government had neither the resources nor the systems in place to reestablish the lifeline in an efficient manner. As any good Army unit would, we flexed our logistical muscles and emplaced a new bridge (see Figure 3.1).

Figure 3.1. Photo of bridge emplaced over the Watapur River. Old concrete bridge is visible lying on the riverbed under the new bridge. Photo by author.

My lesson learned was not how well the United States Army can acquire and transport resources, but rather how the local population was able to adapt exclusive of the technology we were perhaps lost without. As we transitioned to 24-hour operations to secure and reestablish our lifeline, I watched as the local population treated the disaster as a simple inconvenience. Once the initial flood water subsided, a modest foot bridge was emplaced just north of the original bridge location. The locals on the west side of the river established a logistical rally point just outside our security perimeter and locals on the east side simply expanded the original Watapur market to accommodate more merchandise. Merchandise that was usually delivered to Asadabad was simply brought to the Watapur market, purchased, carried across the footbridge, and transported up the valley as it always had. The backflow of goods to Asadabad operated in the same fashion. Even full fuel cans were brought to the market, haggled over, and distributed. Within 48-hours, no one in the valley would have ever known the bridge had washed away unless they were standing on the riverbank to see it. The local people's ability to adapt was astounding. Our inability to get past our normal way of operating could have been claimed as paralyzing. It was all a matter of perspective.

This was the mindset I tried to bring to Newport. I understand that based upon our current way of life a CSZ rupture may seem catastrophic. However, some would argue it may just be a really long, cold, wet, and inconvenient camping trip. The people of the Pech River valley would probably agree with the latter. With this in mind, I tried to understand what challenges Newport is facing as they try and prepare, and understanding the decades long reconstruction and land use changes outlined in the *Oregon Resilience Plan* (2013), help identify what capacities to respond the community already contains that could make the camping trip a little more comfortable. To accomplish this, I set out with three research objectives:

Objective 1: Determine how the preparedness literature suggests accommodating a visiting population and compare this with Newport's current plan and situation.

Objective 2: Determine what obstacles Newport is facing with respect to planning and preparedness for the visiting population, and then identify what challenges exist in mitigating or overcoming these obstacles.

Objective 3: Determine what capacities Newport already contains that can be used to mitigate and or overcome the said challenges, and suggest how they can be applied or utilized to build resilience in the visiting population and the community as a whole.

CONTENT ANALYSIS OF PREPAREDNESS LITERATURE

The first phase of my research was focused on a content analysis of the preparedness literature for Newport, Lincoln County, the State of Oregon, and FEMA. The intent was to understand what should ideally go into a community emergency operations plan, what level of planning and preparation was currently in place, and how that plan and preparation took into account the visiting population. Table 3.1 below displays the documents I reviewed.

Table 3.1. Documents reviewed pertaining to hazard mitigation and emergency response for Newport, Lincoln county, Oregon, and FEMA.

Document name	Echelon	Date
Developing and Maintaining Emergency Operations Plans: Comprehensive Preparedness Guide (CPG 101)	Federal	2010
Oregon Natural Hazard Mitigation Plan	State	2015
State of Oregon Emergency Management Plan	State	2017
State of Oregon Cascadia Subduction Zone Catastrophic Earthquake and Tsunami Operations Plan	State	2012
Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan	County	2015
Lincoln County Emergency Operations Plan	County	2018
Newport Emergency Operations Plan	City	2017
Cascadia Rising 2016 Exercise Joint Multi-State After-Action Report	FEMA	2016
Cascadia Rising: Lincoln County After Action Report -Final	County	2017

I started with CPG 101 to gain an understanding of the emergency planning process and preparedness cycle, and then moved to the documents from the state and county level. With these I gained an understanding of what was expected, or suggested, to comprise a community's emergency operations plan. Using this information, I examined Newport's Emergency Operations plan and compare and contrast its framework to that put forward by each higher echelon. Finally,

I reviewed the after-action reports (AAR) from the 2016 Cascadia Rising exercise to capture the

lessons learned from the event. These documents gave me a baseline understanding of the

challenges currently presented on paper before moving into my interviews with various

community stakeholders for a ground truth discussion.

INTERVIEWS WITH STAKEHOLDERS

The documents in Table 3.1 provided a database from which I composed general

questions to guide my interviews, as well as providing me a starting point for people to interview.

The literature emphasized that any plan and or preparations need to start local and must include

all community stakeholders. With this in mind I developed and defined three groups of people

from which to interview.

The first group I designated as formal. These are people or positions specifically defined

in the emergency management literature, or by name or position in the community, county, or

state emergency operations plan. The second I designated as semiformal. These are people not

fitting the formal description, but whose respective job descriptions included some responsibility

of individual, organizational, or community emergency preparedness. The last I designated as

informal. These are people who are not identified by the state, county, community, or their

organization as emergency personal, but are working to prepare themselves, their organization, or

their community. There were a few people or positions that straddled group boundaries and I

made subjective decisions accordingly. My interview list strove to include people from all three

groups (see Table 3.2).

Table 3.2. List of interviewees with name, position within community, designated group, method of interview, and date of interview.

Name	Position	Group	Method	Date
Althea Rizzo	Oregon Office of Emergency Management GeoHazards Program Coordinator	Formal	Phone	August 08, 2019
Kaety Jacobson	Lincoln County Commissioner	Formal	Person	July 17, 2019
Virginia "Jenny" Demaris	Lincoln County Emergency Manager	Formal	Person	July 22, 2019
Beatriz Botello	Newport City Councilor	Formal	Person	July 10, 2019
Spencer Nebel	Newport City Manager	Formal	Person	July 19, 2019
Regina Martinez	Newport Emergency Preparedness Coordinator	Formal	Person	July 11, 2019 and August 20, 2019
Gerry Schmit	Newport Emergency Management Volunteer	Formal	Person	July 11, 2019
Bobbi Price	Newport Chamber of Commerce Tourism and Festival manager	Formal	Person	September 03, 2019
Cinamon Moffett	Hatfield Marine Science Center Research Program Manager	Semi-formal	Person	July 22, 2019
Renee Fowler	Hatfield Marine Science Center Volunteer Coordinator and Visitor Center Assistant Manager	Semi-formal	Person	July 22, 2019
Molly Dumas	Oregon Coast Aquarium Director of Development	Semi-formal	Person	August 28, 2019
Chris Rogers	Oregon Coast Community College Facilities Manager	Semi-formal	Person	August 29, 2019
Dylan Anderson	Park Ranger at South Beach State Park	Semi-formal	Person	August 09, 2019
Linda Kozlowski	President of the Emergency Volunteer Corps of Nehalem Bay	Semi-formal	Phone	November 03, 2019
Sue Graves	Lincoln County School District Safety Coordinator	Semi-formal	Phone	September 03, 2019
Tyler Newman	Marina Manager at Embarcadero Resort, Hotel, and Marina (Newport)	Informal	Phone	November 21, 2019
Janice Zagata	Owner of the Ocean Inn (Manzanita)	Informal	Phone	September 06, 2019
Drew Roslund	Owner of the Overleaf Lodge and Spa (Yachats)	Informal	Person	August 27, 2019

Each interview was semi-guided and built around discussing each person's role in the community, their personal, organizational, or community challenges as well as strengths with regard to preparedness, perception of the vulnerability of the visiting population, how to reduce the vulnerability of the visiting population, and how to increase the capacity of the community to respond as a whole. Every interview was recorded and written up for further analysis. As I engaged with personnel from each group, I realized each faced different challenges, but also contained information or resources which could improve the response capacity of the whole

community. The interviews did not follow any specific order. I simply coordinated with each person based upon their availability.

The formal and semiformal groups were relatively easy to acquire interviews for, but the informal group presented a challenge. I simply struggled to connect with people willing to discuss this topic with me. Reaching this population also appeared to be a challenge for emergency managers and volunteers (R. Martinez, personal communication, January 4, 2019; L. Kozlowksi, personal communication, November 13, 2019). I eventually made headway through contacts from OEM and Newport's Emergency Preparedness Coordinator, but only ended up with three interviews in this category. While I do think this limited my results, I also think it is a result in itself worth noting, and I address it in my discussion section.

FORMULATING SUGGESTIONS IN BUIDLING RESPONSE CAPACITY

Finally, I attempted to align identified challenges of preparedness within the community to capacities the community currently contained. I did this by connecting the identified knowledge and resources required to overcome the challenge with someone or something the community possesses. For example, some of the challenges presented associated with educating a visiting population, facilitating their evacuation, and then how and where to shelter thousands of visitors. Therefore, I looked to identify a means to connect visitors to disaster management information, people who are occupying the same space and in need of evacuation themselves, and infrastructure within the city that could serve as a relief center.

The goal was to help the community become more resilient by capitalizing on what capacities to respond currently exist within Newport, rather than exceedingly relying on outside jurisdictions. These recommendations are merely suggestions provided by someone who had a brief opportunity to look into the community. While I am sure they are riddled with limitations, I hope these suggestions provide some vision into improving the plan and overall preparedness of a committed community.

CHAPTER 4 –CONTENT ANALYSIS OF PREPAREDNESS LITERATURE

INTRODUCTION

All disasters start local and all disaster preparedness should start local as well (FEMA, 2020). This is because at the core of a disaster is a jurisdiction unable to respond to the impact of a hazard without the help of neighboring and or higher echelon jurisdictions. The success of this model is based upon a balanced approach of top down guidance and bottom up planning and feedback (FEMA, 2020). This section will examine vertical echelons of preparedness documents in order to understand the recommended planning approach, but also identify some of the challenges that may be present for communities such as Newport. I will not cover all aspects of preparedness documents in detail, but will only highlight that which I feel apply to Newport, its visiting population, and are crucial in the vertical integration of all echelons responsible.

Echelons of Emergency Management
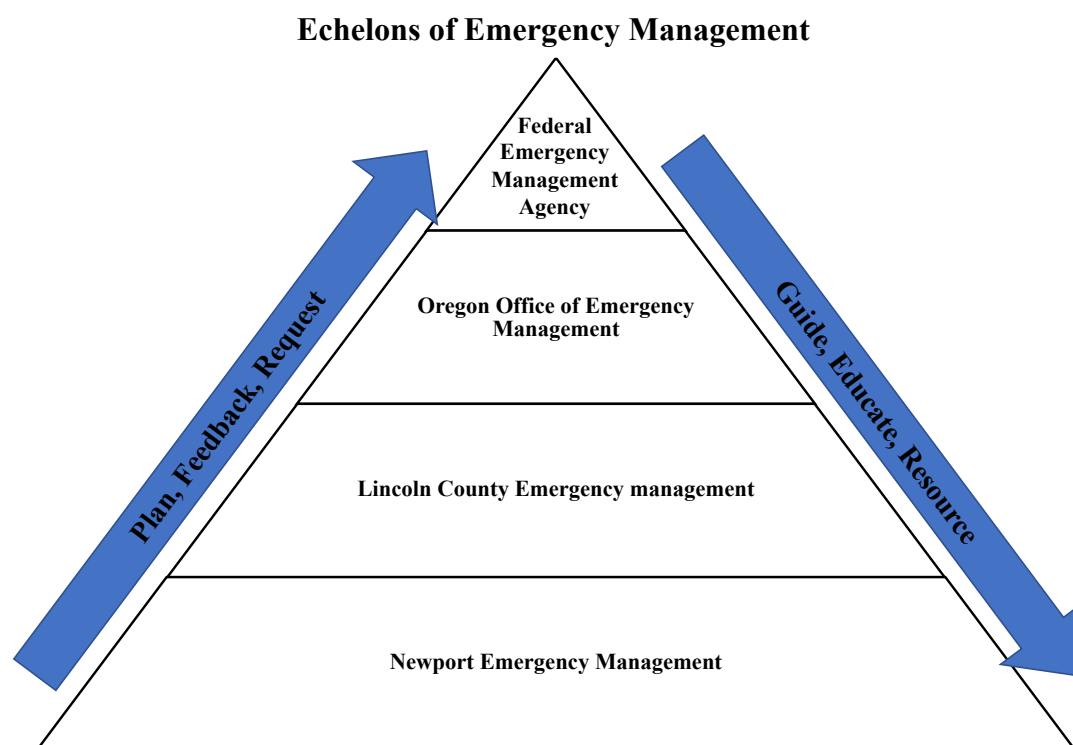
Figure 4.1. Echelons of emergency management. Arrows depict the balance of bottom up planning and feedback, with top down guidance, education, and resourcing. Figure created by author with concepts derived from (FEMA, 2020).

These echelons are FEMA, OEM, Lincoln County Emergency Management, and Newport Emergency Management. FEMA has the role of leading and supporting the nations collaborative and tiered emergency management system, with a jurisdiction extending to all state, tribal, and territorial governments within the United States and its territories (FEMA, 2020; Public Law 100-107). OEM has the role of leading "collaborative state-wide efforts . . . to protect, mitigate, prepare for, respond to, and recover from emergencies or disasters" (https://www.oregon.gov/oem/Pages/About-Us.aspx). OEM's jurisdiction encompasses all city, tribal, and county governments within the State of Oregon (2017 ORS 401.502). However, it is worthy to note that federally recognized tribes may coordinate directly with FEMA, while state only recognized tribes cannot coordinate directly with FEMA, but may coordinate with OEM if they desire (Public Law 200-707).

Lincoln County and Newport have similar roles in that each county must, and each city may, establish an emergency management agency to perform emergency management functions within the territorial limits of each jurisdiction. Neither can operate outside the territorial limits of their respective jurisdiction, unless they are performing an emergency function that was requested and approved by the county, or city, they are performing the emergency function within (2017 ORS 401.305). The tiered system requires extensive coordination and collaboration. When all four echelons operate simultaneously during a disaster, lessons learned are frequent and often captured through AARs to ensure the complex system of emergency management can keep improving (FEMA, 2020). This section is concluded with a discussion of each echelons planning documents, along with the lessons learned from both FEMA and Lincoln County's Cascadia Rising AARs, as they pertain to disaster preparedness in Newport.

COMPREHENSIVE PREPAREDNESS GUIDE 101

Version two of FEMA's *Comprehensive Preparedness Guide 101*: *Developing and Maintaining Emergency Operations Plans* serves the purpose of "provid[ing] guidance for developing an emergency operations plan" and promoting a common understanding in order to help "planners . . . produce integrated, coordinated, and synchronized plans" (FEMA, 2010, p. 3). CPG 101 outlines planning principles, the preparedness cycle, planning approaches, plan integration, and common planning pitfalls for emergency planners to reference. Specifically emphasized in version two is the necessity to represent and engage the whole community during the planning process: "Planning that engages and includes the whole community serves as the focal point for building a collaborative and resilient community" (FEMA, 2010, p. 2).

Planning Principles

The first planning principle is to understand the composition of the population prior to planning, and the second principle is to include all stakeholders in the planning process (FEMA, 2010). For example, according to CPG 101, understanding the demographic, resources, and needs of a population will "have a profound effect on the evacuation [and] shelter operations" (FEMA, 2010, p. 1-1) of any plan. After careful consideration of the population, the fourth principle states planning should consider all hazards, and the fifth claims planning should be flexible enough to include both traditional and catastrophic threats. The basis of these principles is FEMA's concept that "while the causes of emergencies can vary greatly, many of the effects do not" (FEMA, 2010, p. 1-2). Essentially, planners should focus on how the effects of identified hazards will impact the community, and then implement a plan that is flexible enough to simultaneously address a varying degree of requirements across a diverse population.

The sixth principle outlines that the plan "must clearly identify the mission and supporting goals with desired results" (FEMA, 2010, p. 1-2). A clearly identified goal allows unity of effort from the community. The ninth principle establishes that planning needs to identify tasks and allocate resources (FEMA, 2010). The twelfth principle asserts that "effective plans tell those with operational responsibilities what to do and why to do it, and they instruct those outside the jurisdiction in how to provide support" (FEMA, 2010, p. 1-4). This means for a plan to be effective; it must specify how each entity of the community will support the plan in a joint effort to achieve a desired end state, and then after identifying shortfalls within the community, coordinate for outside support as needed.

Planning Approaches, Integration, and Common Pitfalls

With continuous planning there are three distinct approaches identified in CPG 101. First, a scenario-based approach develops a plan based upon a specific hazard. Second, a function-based approach develops a plan based upon the functions a jurisdiction is anticipated to perform during an emergency. Third, a capability-based approach develops a plan based upon a jurisdictions capacity to take a specified course of action (FEMA, 2010).

FEMA advocates for a hybrid approach which comprises all three suggesting that "a hybrid planning approach helps identify the courses of action that a jurisdiction must be able to take and the required functions it must perform based upon a comprehensive risk analysis; thus, it helps identify the capabilities a jurisdiction must have" (FEMA, 2010, p. 1-6). Capabilities go hand in hand with integration, as understanding a required capability that you may lack will help you prioritize your integration efforts to mitigate the gap. Vertical integration "is the concept that the foundation for operations is at the local level and that support from Federal, state, territorial, tribal, regional, and private sector entities is layered onto the local activities" (FEMA, 2010, p. 1-

6). The local planning team identifies a support requirement and the higher echelons of support work with the local team to resource the requirement.

Horizontal integration is the integration of operations across a jurisdiction to confirm continuity and ensuring that a jurisdiction's set of plans supports its neighboring or partnering jurisdictions plans as well (FEMA, 2010). Due to the characteristics of a CSZ rupture, both vertical and horizontal planning will play a large role in the capacity of any involved jurisdiction to respond. Neighboring jurisdictions will be relying on each other for support during the event due to the probability of an overwhelmed state and federal level (FEMA, 2016). Both vertical and horizontal relationships will be tested.

Additionally, CPG 101 outlines four planning pitfalls correlating to any disaster scenario. First, plans are often lengthy and overdetailed when they should be simple and flexible. Second, plans often fail to account for the diversity of the population and are often based upon the average citizen (FEMA, 2010). Consequently, "failing to base planning on the demographics and requirements of the particular community may lead to false planning assumptions, ineffective courses of action, and inaccurate resource calculations" (FEMA, 2010, p. 1-7). Third, plans often assume first responders are the only people who can take action, while past disasters have shown the "public often does their work before responders arrive" (FEMA, 2010, p. 1-8). Finally, plans must be based on validated assumptions and coordinated resources (FEMA, 2010).

OREGON MITIGATION PLAN

Oregon's Comprehensive Emergency Management Plan (Oregon CEMP) is separated into four volumes and then complemented by various support plans. As with CPG 101, this section will not attempt to cover all these documents in detail, but simply emphasize a few

components of *Volume I – Oregon Natural Hazard Mitigation Plan* (Oregon NHMP) that apply

to the planning principles from CPG 101 and the visiting population in Newport.

Oregon's NHMP (SIHMT, 2015) comprises both a state vulnerability assessment and

subsequent mitigation goals. The vulnerability assessment highlights regions, counties, and

specific communities as well as populations which it deems vulnerable based upon both exposure

and sensitivity to specified hazards. The Oregon NHMP classifies region one as the coast, and

includes Clatsop, Tillamook, Lincoln, coastal Lane, coastal Douglas, Coos and Curry Counties.

Oregon NHMP then acknowledges 11 primary natural hazards, to include both Cascadia

subduction earthquakes and tsunamis. "There is no location on the Oregon coast that is immune

to coastal hazards" (SIHMT, 2015, p. 73) and of "particular concern is that the local geology and

geomorphology of the region have restricted development to low-lying areas" (SIHMT, 2015, p.

72) susceptible to inundation from a catastrophic hazard such as a CSZ earthquake.

Based upon the state vulnerability assessment by county, which is calculated by looking

at a hazards record of previous occurrences, likelihood of future occurrences, and the percentage

of the population and property likely affected during an event (SIHMT, 2015), Lincoln county

was ranked as most vulnerable to both earthquake and tsunami hazards. One of the reasons for

this rating is due to Lincoln county's "social vulnerability . . . driven in part by a high percentage

of tourists" (SIHMT, 2015, p. 289) occupying the said low-lying inundation zone. OEM also

acknowledges a CSZ rupture occurring during the tourist season would increase casualties.

> [V]isitors are more vulnerable than residents to both distant and locally generated
> tsunamis, because they are more likely to be at beaches and shoreline parks and
> are generally less aware of hazard response and preparedness. During the
> summer and holidays, visitors can greatly outnumber residents in the small
> coastal towns. While intensive education and outreach programs led by
> DOGAMI and OEM have greatly increased awareness and preparedness,
> residents are much more likely to have received this education than visitors
> (SIHMT, 2015, p. 228).

In 2013, Lincoln county had the "largest single-county share of tourists" (SIHMT, 2015, p. 297) among Oregon's coastal counties. Understanding that reducing the vulnerability in a visiting population can be difficult, Oregon's NHMP encourages mitigation through outreach efforts in places where visitors frequent with the goal to increase awareness and minimize vulnerability in this population. Furthermore, Oregon recognized the significance of its statewide tourism and the impact it has on local, regional, and statewide economies (SIHMT, 2015).

The goal of the Oregon's NHMP is to link each assessed vulnerability to a corresponding mitigation goal. Goal one focuses on protecting life and reducing injuries of those exposed to hazard, goal three aims to increase the resilience of economies within the state, and goal seven is to mitigate the negative impact of natural hazards through information and education (SIHMT, 2015). Each one of these goals aligns with a vulnerable visiting population that directly contributes to a growing economy, all while being plausibly unaware of the hazard zone they occupy. Essentially, the plan assesses that the visiting population in Lincoln County is vulnerable, exacerbates overall county vulnerability, and warrants time and resources within the planning and preparation process.

LINCOLN COUNTY MITIGATION PLAN

Lincoln County has a Multi-Jurisdictional Natural Hazards Mitigation Plan (MJNHMP). This plan evaluates vulnerability and assigns subsequent mitigation goals. As any great county plan should, it aligns with both CPG 101 and Oregon's CEMP.

The mitigation plan supports higher echelon preparedness documents by establishing that the county, and Newport specifically, are considered highly vulnerable

to both a Cascadia earthquake and tsunami. One component of this assessment is understanding the "socio-demographic qualities of the community population . . . are significant factors that can influence the community's ability to cope, adapt, and recover from natural disasters" (Lincoln County, 2015, p. 2-9). The plan then acknowledges a population vulnerability within the county is the expansive visiting population which recreates in or passes through each year. Additionally, the plan outlines a mitigation strategy stating, "population vulnerabilities can be reduced or eliminated with proper outreach and community mitigation planning" (Lincoln County, 2015, p. 2-10).

Lincoln County's mitigation goals align directly with this strategy. Goal seven aims to "motivate the public, private sector, and government agencies . . . through information and education" (Lincoln County, 2015, p. 3-2), goal ten aims to "increase communication, collaboration, and coordination among agencies at all levels" (Lincoln County, 2015, p. 3-2), and goal one aims to ultimately "protect life and reduce injuries" (Lincoln County, 2015, p. 3-2) through the mitigation of natural hazards. Lincoln County's mitigation plan identifies a key vulnerability in their visiting population, and then through their mitigation strategy articulates a commitment to reducing the impact of natural hazards on this population through the engagement of the whole community approach.

THE CASCADIA RISING AFTER-ACTION REPORT

The *Cascadia Rising 2016 Exercise Joint Multi-State After-Action Report (AAR)* (FEMA, 2016) and the *Lincoln County Cascadia Rising AAR* followed the Cascadia Rising Exercise which occurred from June 7-10, 2016. The exercise including 20,000 people from local, state, federal, tribal, Department of Defense, and non-governmental entities. The purpose of the exercise was to test and validate CSZ emergency operations plans through a simulated event. Many of the lessons

learned directly correlate to guidance provided in CPG 101, and planning outlined in both Oregon and Lincoln County preparedness documents.

The opening lesson learned was "emergency management professional in the Pacific Northwest have a long history of collaborating with their regional partners" (FEMA, 2016, p. 5). These pre-existing relationships enabled numerous face-to-face and virtual meetings, which in turn lead to "faster decision-making and enhanced situational awareness" (FEMA, 2016, p. 5). CPG 101 stated that horizontal integration is key to a successful plan (FEMA, 2010), and this exercise highlighted the many informal relationships which bolstered the ability of Pacific Northwest emergency managers to coordinate and integrate with each other.

However, even with an inherent ability to work together, most emergency management jurisdictions lacked the capacity to respond to the complexities of the CSZ scenario. "For numerous jurisdictions, the emergency management function was the responsibility of one staff member or, in some cases, was a collateral duty" (FEMA, 2016, p.6). A collateral duty involves the execution of a task or tasks that our outside a person's primary role or responsibility. This was the case in Newport prior to the establishment of the current emergency preparedness coordinator position in January of 2017 (R. Martinez, personal communication, July 11, 2019). Consequently, jurisdictions lacked an understanding of emergency management doctrine, and lacked the staffing and resources to support an emergency operations center (FEMA, 2016).

Circling back to the preparedness process being continuous and iterative, effective planning and organizing can only occur if the emergency management personnel are adequately trained, as emphasized in the state preparedness plan (SIHMT, 2018). Organizing for emergency management is a local responsibility, but only effective if organized in a manner enabling collaboration and integration. Communities are directed to organize their personal and resources in accordance with the National Incident Management System (NIMS). However, the AAR

highlighted that many local jurisdictions modified the doctrine to fit their local needs. While this is allowed according to NIMS guidance, it made it difficult to integrate across echelons and adapt to the changing environment (FEMA, 2016). This resulted in jurisdictions falling back to traditional response processes and systems that relied on "strict adherence to checklists and standard operation procedures, which did not allow for adequate flexibility to respond" (FEMA, 2016, p. 7-8).

This inability to adapt during the event directly contributed to several noted areas of improvement. The first was the allocation and distribution of resources. Multiple jurisdictions assumed they had a high priority for resource allocation, but there proved to be no clear process for adjudicating simultaneous resource requests. OEM stated one of their primary roles is to put people who need resources in contact with people who have those resources (A. Rizzo, personal communication, August 08, 2019). However, requests were made once a resource was needed, rather than anticipating a need and requesting a resource with an understanding of the lead time required to facilitate the request. This resulted in a bottleneck of limited resources and suggested the need to have "tough conversations on how best to distribute limited resources . . . in advance" (FEMA, 2016, p. 6).

Continuing with resource related improvements, lifesaving resources were prioritized over life sustaining resources. Rotary wing aircraft were overwhelmed by the distribution of life-saving resources and were unable to transport life sustaining resources until later than anticipated. Additionally, mass care plans relied too heavily on traditionally outsourced solutions. Due to the overwhelming numbers of people requiring shelter, there was an unprecedented strain on sheltering logistics (FEMA, 2016). This same discrepancy in supply and demand was extended to urban search and rescue teams. "The demand for urban search and rescue assets following a CSZ

rupture will outstrip the nation's current capacity . . . [and] many trapped people will be rescued by . . . community rescue teams" (FEMA, 2016, p. 16).

ASSESSEMENT AND ANALYSIS OF THIS CONTENT FOR NEWPORT

First, both Oregon's state preparedness plan and emergency operations plan, along with Lincoln County's emergency operations plan, meet all necessary requirements outlined by FEMA (Lincoln County, 2015; SIHMT, 2015). Both are comprehensive in their attempt to outline plans and preparations for all anticipated hazards, and both are great references for Newport. The purpose of this section is to synthesize the information provided in each and discuss how the information may apply to Newport.

According to CPG 101, the preparedness cycle has five components: plan, organize and equip, train, exercise, and evaluate and improve. Like the NPF mission areas these components are overlapping, continuous, and often occurring simultaneously. Planning is simply the continuous process to manage risk. It should be iterative and dynamic, and most importantly does not need to start from scratch (FEMA, 2010). Wherever you are in the preparedness cycle is a great place to start from, evaluate, and continuously improve. The question for Newport is where is the community at, and how do they best evaluate and improve?

Based upon the areas of improvement from the AAR it appears that not only do disasters start local, but the CSZ rupture may force communities to develop the capacity to respond locally as well. The AAR emphasized that communities need to "determine how to utilize local assets or . . . deploy basic resources . . . to fill the larger need", and they "need to develop more realistic expectations of their mass care needs independent of support" (FEMA, 2016, p. 16). Given the characteristics of this hazard "emergency managers and their partners will need to employ creative and innovate solutions to address overwhelming shortfalls and challenges" during a CSZ.

(FEMA, 2016, p. 9). This ties back to planning based upon valid assumptions (FEMA, 2010). According to the 2016 Cascadia Rising simulation, a valid assumption is Newport will be operating unilaterally immediately following the event.

With the local planning and organization as the focal point moving forward, Oregon's Emergency Operations Plan specifically identifies visiting populations as a vulnerable population and categorizes them as having both access and functional needs. It further directs each local community to develop strategies and procedures to accommodate their visiting population (SIHMT, 2018). Lincoln County's mitigation plan mirrors this vulnerability analysis, but the emergency operations plan does not list them under the at-risk populations, nor are they listed within the demographic analysis.

Previous studies in Newport have shown that the potential for loss of life is a major concern during a tsunami event (Wood, Good, and Goodwin, 2002, p. 155). With a disproportionally represented visiting population in the inundation zone, specifying them as vulnerable, and aligning them with supporting mitigation goals could alleviate the risk of overlooking some of the challenges particular to this group. The visiting population has specific characteristics which impact their evacuation, shelter, and mass care. If these characteristics are not specified in the planning process, there is a risk they will not be effectively mitigated prior to the event and inhibit effective and efficient response

While the Emergency Operations Plan may not specifically identify the visiting population by name, it does address the requirements for evacuation, food, shelter, and mass care of large displaced populations during disaster events. Additionally, the plan acknowledges tourism is one of the foundations of the county's economy and nearly one third of the counties workforce is employed in the tourism industry (Lincoln County, 2018). With research concluding that "historically, 80 percent of disaster burden falls on the public" (Lincoln County, 2015, p. 2-

9), then the document from which public planning and preparedness begins should include all vulnerable populations within the jurisdiction. Finally, if the public is anticipated to carry a heavy load, and one third of the public is occupying the same space as the visiting population, then the community could benefit from having a plan that integrates this co-located local population.

With this baseline in mind, and moving to the component of organizing and equipping, understanding what resources you have enables you to know what resources you need. Thus, enabling you to instruct those outside your jurisdiction on what support you anticipate requiring (C. Moffet, personal discussion, July 22, 2019). The first challenge of organization was highlighted as a lack of response capacity for local emergency managers, largely due to resource constraints of personnel and accordingly time dedicated to emergency planning. This capacity may be connected to the fact that in Oregon, all counties are required to develop an EOP in accordance with CPG 101, but city EOPs are only strongly recommended (2017 ORS 401.305). Furthermore, the Lincoln County EOP states county emergency managers will focus efforts outside of municipality boundaries (2015). Consequently, population centers with multiple tourist destinations may be underrepresented with both personnel and planning when it comes to emergency preparedness.

Adequate planning involves an accurate resource picture and initiating planning at the local level enables communities to communicate both resource availability and resource requirements horizontally and vertically. Rescue and relief will be resource intensive for a CSZ, therefore having a valid resource picture will enable communities to request required resources before the rupture occurs, or at least plan to operate without them. Newport's challenge should their population forecast increase substantially, due to a large visiting population on a given day, is that this increase may strain and or compromise the ability of the community to adequately shelter and provide mass care to the entire population (Cutter et al., 2003). Therefore, an

inadequately accounted for visiting population during planning could hinder response efforts. Additionally, for a CSZ rupture, not only will the resources need to be coordinated ahead of time, but if lifeline degradation assumptions are valid, resources for shelter and mass care may need to be on hand ahead of time.

The third component, training, occurs once a community identifies what knowledge or skill gaps are present in the population, and then determines what and who needs to be prioritized in the training plan. For the visiting population, prior research has suggested the hospitality industry would be a great candidate for training in crowd management and evacuation due to their proximity to both the hazard zone and the visiting population (Wood and Good, 2004). Due to the fact that a large portion of the hospitality employees during the summer months are seasonal workers (R. Martinez, personal communication, July 11, 2019), a focus on this population could possibly improve the capacity of both the visiting population and the seasonal workforce to respond.

Because the community will have to play an integral role in the response plan, a suggestion would be to include them in a way that can operationalize their efforts. The training of this local population to facilitate emergency response ties back into identifying the required functions needed to serve an individual, group, or community, and then developing the requisite capabilities to achieve that function (FEMA, 2010). For Newport, the hazard creates a scenario of a large visiting population isolated within the community for an extended period. The requisite functions become evacuating, sheltering, and providing mass care for this population, and the capability question is then does the community have people, organizations, resources, training, and planning "to perform [this] required emergency function" (FEMA, 2010, p. 1-6)?

The exercise component may be the most challenging for a CSZ due to the long recurrence interval of the hazard. Communities that experience annual hazards have the

opportunity to exercise their emergency operations plan, evaluate it (component four) and improve it (component five) for future events. Newport could use their traditional and frequent hazards to evaluate and improve their catastrophic hazard plan. The winter storm of December 2007 sparked the initiation of the Emergency Volunteer Corp of Nehalem Bay, because the community realized they were not prepared to adequately provide rescue and relief during isolating events such as a future CSZ rupture (L. Kozlowski, personal communication, November 03, 2019).

Transitioning to Interviews

The good news is the personnel with whom I interviewed articulated a deep commitment to ensuring the visiting population is represented in the preparedness process. Therefore, the first step is already made, and the next step is transferring this commitment to a viable plan. The greatest challenge in this planning process will be for Newport to build the capacity to respond unilaterally with a visiting population two to three times the size of the local population. This initial independent response suggests that what the community determines they need to respond with, both knowledge and resources, must be present in the community before the event.

While it is easy to say a population is vulnerable, it is often complicated and both time and resource intensive to actually take the necessary steps to build that populations capacity to respond, especially when that population is not consistently present within the community. This content review highlighted specific challenges in resourcing emergency personnel, information, and equipment in Oregon's coastal communities, and fundamentally building the capacity to evacuate, shelter, and provide mass care for an extended period of time without access to all the echelons of the tiered system of emergency management.

The goal of semi-structured interviews was to identify Newport's specific challenges with employing creative solutions amongst "overwhelming shortfalls" (FEMA, 2016, p.9), shortfalls in resourcing personnel, knowledge, and infrastructure to mitigate the impact a CSZ rupture with a large visiting population. Then, the goal was to identify resources in the community which could be utilized to help alleviate these gaps. The questions that arose centered around who is responsible for the preparedness of the perpetually changing visiting population? This ties back to the three ways in which the vulnerability of the visiting population can be addressed: build the capacity of the visiting population to respond themselves, increase the capacity of the community to facilitate the desired response, or implement a combination of both. Who should educate the visiting population, resources them, and ultimately ensures their evacuation, shelter, and transport? Is it the responsibility of the visitor, or does the community play a role, and if so, what should that role be, and how can those capacities be accomplished?

CHAPTER 5 – THREE STORIES: DIFFERENT CHALLENGES, DIFFERENT STRENGTHS, AND DIFFERENT RECOMMENDATIONS MOVING FORWARD

INTRODUCTION

Ideally, Newport's emergency operations plan should identify the visiting population as vulnerable, outline what characteristics make them vulnerable along with their specific needs, and identify the functions and capacities the community will use to mitigate the impact of the hazard on this population. However, in reality the published plan does not specifically address this population, and while visitors are a major concern in the planning process, the community is facing challenges in preparing to evacuate, shelter, and provide mass care for local population estimates, let alone the vast and perpetually changing visiting population. For example, neither Newport nor Lincoln County currently have a mass care plan, although Lincoln County has submitted an application for a grant to hire a contractor to write a plan (R. Martinez, personal communication, August 20, 2019). To try and understand these challenges I spoke to 18 different people traversing the aforementioned formal, semiformal, and informal groups. Upon listening to their challenges, I also heard their strengths and recommendations on how the community could plan for and prepare to sustain its visiting population through a CSZ rupture.

This chapter is the results of these interviews. It is separated into three major sections, and each major section is subdivided into three additional subsections. The larger sections are delineated by group: the formal group, informal group, and semiformal group. Then, each group's section is subdivided into the groups expressed challenges, strengths, and recommendations for emergency management moving forward. These results are a summary of the perspectives of those interviewed as understood by the author. Specific quotations are used when fitting, and viewpoints are synthesized if the

theme was generally expressed by the group as a whole. Additionally, any conclusions exclusively interpreted by the author through these interviews are specified.

FORMAL EMERGENCY MANAGEMENT

The formal group contained eight people and represented all three echelons of emergency management within the State of Oregon and formal government representation at the county and city level. Every single member of the group agreed the visiting population was vulnerable, due to a lack of knowledge of the area, the hazard and presumably emergency preparedness, and lacking resources to evacuate and sustain themselves within the community for an extended period of time. As stated by Althea Rizzo, "if they [the visiting population] are prepared, they will have three days of supplies" (personal communication, August 08, 2019).

This leaves the visiting population far short of the suggested two weeks ready. Two weeks ready is OEM's goal for all Oregonians. Traditionally, emergency managers have suggested having supplies on hand to sustain yourself and your household for 72 hours, but with the potential impacts of a large earthquake and tsunami, OEM now suggests that 72 hours will not be enough and Oregonians should aim for two weeks of supplies (https://www.oregon.gov/OEM/hazardsprep/Pages/2-Weeks-Ready.aspx). With the first priority being evacuation out of the inundation zone and the second providing shelter and mass care, the formal group in Newport agreed there is a gap to close, but also generally agreed that they "are committed to getting there" (S. Nebel, personal communication, July 19, 2019). This section will articulate the group's communicated challenges, expressed or derived strengths, and discuss recommendations presented by the interviewees with regard to moving forward.

Challenges Expressed by the Formal Group

The first challenge is the relative modernity of knowledge of the hazard itself and the fact the necessary steps of mitigation and preparedness take time and resources. A. Rizzo recalled that while the hazard was discovered in the 1980's, it was not until the 2004 Sumatra Andaman and 2011 Tohoku Earthquakes that the state was able to gain traction with policy makers, because people were actually able to see the impact (personal communication, August 08, 2019). Figure 1.1 corroborates this conclusion, showing statewide vulnerability analysis and resilience plans coinciding with earthquakes and tsunamis occurring across the Pacific Rim. These illustrations assisted with awareness, but may have also created a perception that preparation efforts may be futile due to the potential magnitude of the event and the coinciding vulnerability of our infrastructure.

Lincoln County commissioner K. Jacobson stated it is "really easy to get stuck in the mindset that we are not prepared, and we are not going to be, and this is not helpful thinking" (personal communication, July 17, 2019). The challenge as outlined by Newport emergency volunteer G. Schmit is to be able to "step back and look at [preparedness] from a greater timeline . . . as just in my lifetime continental drift was a pretty wild theory" (personal communication, July 11, 2019). G. Schmit now gives presentations at community outreach events focusing on the mechanism of a subduction zone earthquake and the differences between Newport's local and distant tsunami threat. Essentially with a looming catastrophic hazard, the fear of an inability to prepare can be paralyzing. R. Martinez received feedback from the community that preparing for a CSZ feels like preparing for an asteroid to hit (personal communication, July 11, 2019) due to its magnitude and probability.

The second challenge is the looming inability to effectively integrate vertically and horizontally during the initial response. Emergency preparedness relies on the ability to coordinate lifesaving and life sustaining resources with neighboring jurisdictions, and to distribute these resources from national, state, and county jurisdictions to the community level. In reality, it will take the state between two weeks and 30 days to get systems in place to deliver these resources (A. Rizzo, personal communication, August 08, 2019). Planning to respond unilaterally places great strain on the community to provide shelter, food, water, and medical supplies for thousands of people over several weeks. A cache, or secure place to store emergency supplies in this case, requires containers, an inflow of supplies, personal to inspect and rotate out provisions, and local governments currently do not have the capacity to do this (V. Demaris, personal communication, July 22, 2019).

With the challenge of local preparation comes the fact that in coastal communities with tourism-based economies, cities like Newport have a visiting population that greatly outnumbers their local population (A. Rizzo, personal communication, August 08, 2019; R. Martinez, personal communication, July 11, 2019). With a local population of just over 10,000, the gross population of Newport may increase to over 30,000 on any given day (R. Martinez, July 11, 2019).

> "The visiting population are themselves at risk, and the population puts additional pressure on the resident population to be prepared to deal with the aftermath of a CSZ event . . . I can do all the preparation at my house that can set me up for a successful two weeks, but there are several hundred people at the Embarcadero [a resort on the bayfront] that will undoubtedly head for high ground and end up in my neighborhood and we do not really have provisions to deal with that type of scenario in those kinds of locations" (S. Nebel, personal communication, July 19, 2019)

The challenge already exists in effectively educating and resourcing the local population. Consequently, adding a perpetually changing visiting population, and

adequately preparing them, and/or preparing the local population to include them with their preparations requires finding the time and resources in the community.

All three of these challenges are further exacerbated by the challenge to develop and sustains an accurate and consistent message to both locals and visitors alike. For the visiting population, it is difficult to prepare them once they arrive. Adequate preparation must start before they depart their resident community (V. Demaris, personal communication, July 22, 2019). This delegates an emergency preparation responsibility to both local emergency managers from wherever the visitors permanently reside, and to the hospitality industry whom the visitor is most likely communicating with. However, an effective working relationship between emergency managers and hospitality industry owners and employees is challenging.

R. Martinez stated she reached out to every business listed by the chamber of commerce in 2018 and received three responses (personal communication, August 20, 2019). For reference, as of January 2020, there are 65 businesses registered under lodging and travel alone (http://business.newportchamber.org/list). I witnessed a similar turnout at the People's Coast summit when only six of 82 registered businesses were represented at the disaster planning and management workshop. Additionally, based upon my own observations, there appears to be no single representation for emergency management in the hospitality sector who could help coordinate and organize preparation efforts with emergency managers, or at least facilitate communication to build awareness.

I concluded that the point of sharing these challenges was not to point the finger at the hospitality industry, but to highlight the fact this relationship needs to be evaluated and developed if reducing the vulnerability of the visiting population is to be achieved. Many of these establishments are small family owned businesses who have to prioritize

their time and resources, and emergency preparedness requires a significant allocation of effort (A. Rizzo, personal communication, August 08, 2019). Additionally, when you are trying to earn a living there is a legitimate fear of scaring the customer (K. Jacobson, personal communication, July 17, 2019). The challenge becomes building a trusting relationship where the return on investment is worth the effort.

A challenge for building trust that was articulated in the interviews was the passing of Oregon House Bill 3309 in 2019. The bill repealed certain restrictions of construction in the tsunami inundation zone that were previously emplaced under ORS 455.446, and has often been referred to as the removal of the tsunami inundation line. This action at the state level caused confusion at the local level where community members started questioning whether the tsunami threat was real or whether the commitment to preparedness was genuine? I concluded from this discussion that the point is not whether the decision was right or wrong, but that the messaging, or lack thereof, impacted perception at the local level.

Strengths Expressed by the Formal Group

With the notion that risk centers at the intersection of the hazard and the human population, Newport's greatest strength resides in the fact its physical geography creates a relatively small inundation zone. Seaside for example has 87 percent of its developed land in the inundation zone, while Newport only has 16 percent (Wood, 2007). This makes evacuation a more manageable task and provides more options for assembly areas and mass care locations.

The second strength is the demonstrated commitment to preparedness and the overall resilience of the local population. I asked every person what they felt made Newport, or Oregon's coastal communities, resilient. This is what they said:

> "There are very passionate people on the coast that are spending vast amounts of time on this issue" (A. Rizzo, personal communication, August 08, 2019).

> "The coastal people are resilient, self-sufficient, educated, aware of the coastal hazards, and bring with them a help your neighbor attitude and approach" (K. Jacobson, personal communication, July 17, 2019)

> "Volunteers and motivated emergency personnel" (B. Botello, personal communication, July 10, 2019).

> "The whole community mindset. Communities are very conscientious about wasting our natural resources, they are good stewards of the land, which translates well to emergency management" (R. Martinez, personal communication, July 11, 2019)

> "Local residents have self-determination when dealing with issues, to live on the coast you have to be tough" (S. Nebel, personal communication, July 19, 2019)

> "The energy of the people and the planning taking place" (Gerry Schmit, personal communication, July 11, 2019)

The bottom line is the willingness and ability of the local population to cope with and adapt during the hazard may enable the formal emergency management systems to focus on a presumably less prepared visiting population.

Further expressed, while the visiting population has been difficult to communicate with, some vacation owners from eastern Oregon, or even out of state have made the trip to be physically present for emergency management presentations and workshops (V. Demaris, personal communication, July 22, 2019). These individuals may be utilized as spokes people for their home communities, ensuring more people who visit the coast are prepared for its hazards. Additionally, coastal visitors should be relieved that every emergency manager or government official interviewed is considering the robust visiting

population in the planning process. The term "community member" is extended to everyone who is in the community at any given time: a local or visiting designation is not existent (V. Demaris, personal communication, July 22, 2019; R. Martinez, personal communication, July 11, 2019).

The final strength directly opposes the challenging mindset that preparation in the face of Cascadia may be fruitless. Progress is being made with planning and preparedness. The community is past denial, in the stage of acceptance, and developing a plan (G. Schmit, personal communication, July 11, 2019). They have capitalized on their connections with the Hatfield Marine Science Center (HMSC), National Oceanic and Atmospheric Administration (NOAA), and Oregon State University (OSU) (S. Nebel, personal communication, July 19, 2019), and have integrated them were applicable in both education and resource distribution. Specifically, HMSC has a tsunami exhibit, the South Beach community has a tsunami interpretive trail to educate and raise awareness, and NOAA has supplied caches with medical supplies for mass care. Additionally, while controversial in its emplacement, the OSU Marine Studies building does provide a means for evacuation in a dedicated evacuation structure and has served as a discussion point for education and awareness.

While preparedness may not always be occurring at the ideal rate, community evacuation drills are occurring (K. Jacobson, personal communication, July 17, 2019) and the hospitality industry is now getting involved with emergency preparedness (R. Martinez, personal communication, August 20, 2019). K. Jacobsen asserted that, "the county has elevated emergency management and the role of emergency management" (personal communication, July 17, 2019) and R. Martinez added, "volunteers are beginning to offset some of the financial challenges with [professional emergency

management] personnel" in Newport (personal communication, August 20, 2019). Martinez then claimed that "it takes a village to be successful in emergency management" due to the requirements for collaboration (personal communication, July 11, 2019), and I believe Newport has articulated the will and is demonstrating the commitment to effectively cooperate in this area.

Recommendations Presented by the Formal Group

The formal sector of Newport understands there is a large visiting population that will strain its resources and response systems, but a capable local population that can be harnessed if the message is clear and consistent. The recommendation is to harden all infrastructure for evacuation, mass care, and community supporting lifelines, deliver a clear and consistent message for preparation across jurisdictions, incorporate and operationalize the hospitality industry, and introduce supporting legislation.

The hardening of infrastructure will allow evacuation from the inundation zone to a location with an earthquake resilient structure (A. Rizzo, personal communication, August 08, 2019) and a transportation system which will allow visitors to be transported out and resources to be transported into the community (V. Demaris, personal communication, July 19, 2019). The process is already underway in the community with the seismic retrofitting of schools (S. Graves, personal communication, September 03, 2019), the fire hall, and the construction of a new hospital to seismic standards (Spencer Nebel, July 19, 2019).

In Newport, the goal is for plans and preparations to begin at the local level. First the individual, then the household, the neighborhood, and eventually the community (R. Martinez, personal communication, July 11, 2019). Every person that is prepared takes

pressure of the system. A. Rizzo stated, "If local residents are prepared, then the community can focus on delivering aid and mass care to visitors" (personal communication, August 08, 2019).

The most important aspect of this plan is the message, and how it is delivered. First, there is a need to balance delivering a message that enables people to grasp the impact of the hazard and care enough to initiate individual and community preparedness, without trying to scare them into preparing. K. Jacobson state that, "the apocalyptic message is not helpful. It is a lost opportunity to educate someone on risk and how to mitigate it" (personal communication, July 17, 2019). Especially when working with small businesses, A. Rizzo noted "the carrot is more valuable than the stick, as any preparations done are the result of immense amounts of effort" (personal communication, August 08, 2019). More than one interview suggested that it is far more beneficial to educate, and reward efforts done to prepare (A. Rizzo, personal communication, August 08, 2019; R. Martinez, personal communication, August 20, 2019)

However, it is also clear that the difficult conversations need to be had before the event (FEMA, 2016). For example, R. Martinez identified, "the city [Newport] has a plan, but the plan does not include taking care of everyone. If everyone is counting on the city to prepare and respond for them, then the city will be overwhelmed" (personal communication, July 11, 2019). The reality is it will be hard and uncomfortable, but doable (V. Demaris, personal communication, July 22, 2019). It is a joint responsibility of the state, county, and community to educate the population on the risk and the way in which they can mitigate such risk. The information is available, educating people and raising awareness in the visiting population is not going to scare anyone away. In fact,

"as awareness has increased so has tourism dollars on the coast" (A. Rizzo, personal

communication, August 08, 2019).

The second aspect is the consistency of the message, "especially since the visiting

community may only be engaged one time for a dart throw of information, it has to be

consistent" (K. Jacobson, personal communication, July 17, 2019). Locals and visitors

travel the entire coast, and the message needs to be uniform (S. Nebel, personal

communication, July 19, 2019). The removal of the state inundation line is one example,

but everyone must also decide whether we are educating to an 8.0 M_W or a 9.0 M_W event.

The recurrence interval for a 9.0 M_W (full rupture) is 7-12 percent in the next 50 years,

compared to 37-42 percent for the 8.0 M_W (partial rupture), but the inundation zone for

the 9.0 M_W is much greater (Goldfinger et al. 2012). K. Jacobson emphasized that there is

a difference between information changing, and everyone publishing their own message

(personal communication, July 17, 2019). The inconsistency leads to confusion, and with

it a questioning of the policy and the science behind the planning.

The final aspect of the message is that "Cascadia Ready" is the culmination of

extensive mitigation and preparedness efforts. A. Rizzo emphasized that communities

like Newport experience multiple coastal hazards, and as stated by FEMA the impacts are

often the same (FEMA, 2011). Thus, the "gold standard" should be Cascadia Ready, or

prepared for a CSZ rupture and its impacts. Preparation for each other hazard can serve as

progress toward Cascadia Ready, and responding to each enables the community to test

and improve its emergency capabilities (personal communication, August 08, 2019).

From my experience in leadership, goal setting helps a group focus, and achieving sub-

goals on the way to a larger goal helps build and maintain momentum.

Understanding the physical space the visiting population occupies in the community, the formal sector recognizes the local hospitality industry co-occupies this same space. This makes them a great candidate for outreach efforts and the same rules of messaging previously mentioned apply: be clear, consistent, and honest, but also constructive in regard to a focus on risk mitigation and preparedness efforts.

Operationalizing the hospitality industry starts with an effort to educate the visiting population and this education could be accomplished using multiple techniques. Educating visitors in their home counties on emergency preparedness before they leave home is the first step in ensuring they are ready (V. Demaris, personal communication, July 22, 2019). Second, include emergency information in confirmation emails from hotels when reservations are made. Outline the coastal hazards, the inundation zone, evacuation routes, and assembly areas. However, focus the information on general beach safety and that the community cares about you and wants you to have a safe visit (A. Rizzo, personal communication, August 08, 2019; R. Martinez, personal communication, July 11, 2019). Finally, the goal would not end at a just messaging, but the plan would be to educate and equip the entire hospitality industry to act as ambassadors for the visiting population (V. Demaris, personal communication, July 22, 2019).

Finally, Newport could introduce an ordinance to support the preparation effort. A requirement for hotels and restaurants in the inundation zone to post tsunami evacuation information may be instructive and useful (R. Martinez, personal communication, July 11, 2019; S. Nebel, personal communication, July 19, 2019). In Japan 90-95 percent of the casualties occurred in the first hour due to the tsunami (A. Rizzo, personal communication, August 08, 2019), therefore any effort to improve evacuation could save lives. However, R. Martinez noted "it is important to ensure businesses can actually do

what the community wants them to do before we just impose an ordinance" (personal communication, August 20, 2019). That is why she is reaching out to every business the ordinance would impact and soliciting their feedback before moving forward. My conclusion is that the end goal is to have a hospitality industry that is educated in emergency management and collaborating with the community to increase both their own capacity to respond and that of the visiting population.

INFORMAL EMERGENCY MANAGEMENT

The informal group contained three people from three different coastal communities. All three were community members without any formal emergency management training or designation, besides T. Newman who spent time with the United States Coast Guard. Simply put, they were concerned with the preparedness of their employees and the role of their establishment in the preparedness of the visiting population.

First, all three members of this group agreed the visiting population was vulnerable due to a lack of knowledge on the hazard and the area they were visiting. Additionally, each felt that while the visitor does hold some responsibility for their own preparedness, both the local community and its businesses play a role in the preparation of the visiting population. The following section provides background information on each establishment and includes their current preparedness situation. It then articulates the challenges they face in both planning and preparation, inherent capacities within each organization, and their recommendations to move forward.

The Situation for the Informal Group

The Embarcadero Resort and Marina is located along Newport's Historic Bayfront. The resort contains condos, a banquet hall, and a marina. The Marina has an all hazards response plan and the Embarcadero is working to develop one for the installation as a whole. Currently, they are focusing on educating their employees and visitors on coastal hazards and emergency preparation. The Embarcadero has worked extensively with R. Martinez and her volunteer corps and currently have hazard, tsunami evacuation, and emergency contact information in every room. T. Newman, the marina manager said the goal is to be "proactive not reactive" (personal communication, November 21, 2019).

The Overleaf Lodge and Spa is a family owned business in Yachats, Oregon, approximately 25 miles south of Newport on Highway 101. When full, the business holds 150 guests, plus staff. One of the owners, D. Roslund, offered his insight on emergency management as business owner on the coast: the Overleaf has its own emergency operations plan, provides tsunami evacuation maps in every room, and participated in the 2016 Oregon coast wide tsunami evacuation drill. D. Roslund asserted that the Overleaf is continuously working to improve their preparedness through refining their emergency operations plan, educating their employees, and building a cache of supplies to support the staff and visitors should it be needed (D. Roslund, personal communication, August 27, 2019).

The Ocean Inn is a small family-owned hotel in Manzanita, Oregon, with 11 rooms. The owner J. Zagata donated her time sharing with me her experience in helping visitors prepare for a CSZ event. She said that the Ocean Inn provides a go bag in every room with two days worth of supplies. Attached to the go bag is an evacuation map made by J. Zagata. The Inn informs everyone staying with them that the go bag is in their room

with an evacuation map should they need it. The goal was to provide each guest the means to evacuate and survive for two days, which would give them enough time to get to a safe gathering location to receive further aid (J. Zagata, personal communication, September 06, 2019).

I think it is important to note that, like the formal emergency management sector, I experienced some communication challenges with the hospitality industry. My interaction was limited to a very small number of businesses. While this undoubtedly impacted my results, I think it is more important to view it as a result in itself as opposed to a limitation. It was obvious to me that these three people had multiple priorities for their time, and I am grateful they were willing to sacrifice some of it for me. I walked away from these conversations with the assumption that many of these small business in the hospitality industry have the will to support emergency management efforts, although the time and resources may be difficult to come by. However, I also understand that the population I interacted with were a self-selected group who were willing to discuss the topic of emergency management. I therefore imagine there is some sampling bias evident in my results and assumptions.

Challenges Expressed by the Informal Group

There were three primary challenges articulated by the informal group members. The first was the art of conveying a message that balances education with risk, the second was educating and organizing within their own organization, and the last was coordinating their preparation and response efforts with the community. It is important to note that only one of these organization was present in Newport, The Embarcadero Resort and Marina. However, I believe the information from both the Ocean Inn and the

Overleaf Lodge and Spa are applicable even though they are outside the jurisdiction of Newport.

As with the formal group, an ever-present challenge was how to convey a message that will enable education and preparation by the visiting population, but not overwhelm them to the point that they become frightened. D. Roslund said he is always searching for a happy medium, but also wants to make sure he does not overpromise his visitors. The goal is to balance what the establishment promises with what they can actually do in regard to preparation. Part of preparedness is providing reasonable expectations. D. Roslund indicated that informing and educating the visitor is reasonable, and part of that responsibility rests on the business and the local community (personal communication, August 27, 2019).

J. Zagata said the Ocean Inn does not sensationalize the message about the potential hazard. They include the go bag and the evacuation information as part of the standard room brief when a guest arrives. J. Zagata noted that responses vary, as some customers have no clue about the necessity for the bag, some are grateful the bag is there, and others say "that's great, I also brought my own bag because we were not sure what you would have" (J. Zagata, personal communication, September 09, 2019). T. Newman also said the initial feedback was positive with respect to just providing the basic hazard and evacuation information. According to T. Newman, so far guests have expressed gratitude for providing the material (T. Newman, personal communication, November 21, 2019).

The second challenge is educating and organizing within the business itself. T. Newman stated that The Embarcadero has "a lot of moving parts, different people, and different priorities, so it is difficult to get a universal plan . . . [or] get everyone together

to rehearse" (personal communication, November 21, 2019). D. Roslund said his key

staff does not turn over regularly, but he does have staff members that are employed for

only one month. Currently there were ten housekeepers who were there for less than two

months. D. Roslund indicated that his biggest challenge is ensuring that when the

earthquake occurs, he has a group of staff members that can go immediately into action.

Currently, if the earthquake occurs after hours, he suggested the key staff would not be

present (D. Roslund, personal communication, August 27, 2019). For smaller lodging

facilities like the Ocean Inn, it is possible the earthquake will occur when no staff is

present at all (J. Zagata, personal communication, September 06, 2019).

The final challenge is coordinating and organizing preparation and response

efforts within the community. T. Newman stated The Embarcadero is currently not linked

with any surrounding businesses with regard to emergency management, but he thinks

this would be a great step moving forward (personal communication, November 21,

2019). J. Zagata stated the Ocean Inn is not tied into any community level emergency

operations plan besides just being a spokesperson for preparedness within the hospitality

industry (personal communication, September 06, 2019). D. Roslund stated that a

concern is not knowing what other neighboring businesses are doing? To his knowledge,

no one in the community is working to coordinate and organize a group preparedness

effort (personal communication, August 27, 2019). One issue present to Yachats, but not

Newport, is the funding of a full-time emergency preparedness coordinator.

> "If I had an emergency preparedness coordinator willing to come to my
> establishment, I would be all over it. I have a plan that I think is reasonable, but if I
> had an expert who could review and improve my plan and ensure it is nested in the
> community, I would appreciate it" (D. Roslund, personal communication, August
> 27, 2019).

While Newport has a full-time coordinator, this is not the case for multiple coastal

communities. For example, in Lincoln County, only two of the six cities have

coordinators and only Newport's is full time (V. Demaris, personal communication, July

22, 2019).

The coordination and organization may present the largest hurdle for these

businesses. Questions arose on what should the businesses priority of effort be? How do

they ensure their efforts are aligned with the communities, and with expected resource

shortages where can they place a cache that will be outside of the tsunami zone, but

accessible to their guests? The Overleaf Lodge for example has a developing cache, but it

is currently on the property inside the inundation zone. Each business expressed a

concern for the welfare of their visitors and was acting within their knowledge and

resource capabilities to ensure preparation was being completed. However, it was evident

that each one of these businesses was lacking full integration into a community wide

effort.

Strengths Expressed by the Informal Group

The strengths of each of these organizations were the people and their

demonstrated care for the safety and wellbeing of their employees and customers. When

asked why they made the steps in emergency preparedness, I received the following

results:

The "safety of our guests is important . . . [and] businesses need to at least
provide information on the hazard, what to expect, and how [the visitor] can prepare" (T.
Newman, personal communication, November 21, 2019).

"We felt a level of responsibility for our guests, so we decided to do something
by putting go bags and evacuation maps in every room" (J. Zagata, personal
communication, September 06, 2019).

"We have to assume that the tourist is naïve, that they do not understand the hazard, and even if they do it is most likely not on their mind during their visit. Whatever education and whatever preparation that needs to be given, I think that is on the business or the community in letting the visitors know" (D. Roslund, personal communication, August 27, 2019).

Given these statements, I would agree with the formal group that the people care, and if operationalized, local members of the community can be at the center of a resilient jurisdiction. These three businesses are ambassadors for emergency preparedness in the informal sector along the Oregon coast. They are working to educate, raise awareness, and when possible provide resources to the visiting population. According to J. Zagata, "If our customers are ok and have what they need then they can just be directed to go where they need to be, and the emergency volunteers can focus on the big things for the community" (personal communication, September 06, 2019). An even greater impact of the preparedness of these businesses, is that other businesses may be following these examples (J. Zagata, personal communication, September 06, 2019).

Recommendations Presented by the Informal Group

The key piece I took away from my discussions with the informal group is that they understand a complete solution to the evacuation, shelter, and mass care of the visiting population is complex, resource intensive, and requires a whole community approach. However, they had several suggestions which may be beneficial to moving the visiting population closer to the goal of being two weeks ready. They centered on educating the visiting population, having access to an emergency preparedness coordinator, establishing a program similar to a Community Emergency Response Team on the waterfront, and capitalizing on the hospitality industries access to resources.

First, it was clear through the interviews that it is a responsibility of the business to educate the visitors as all three establishments agreed that the first step is ensuring the

visiting population is educated and aware of the hazard. Education is important, as J.

Zagata expressed that her go bags cannot cater to all individuals. They are a basic

collection of supplies, but if a visitor has a special need such as a dietary restriction, they

need to make that preparation themselves (personal communication, September 06,

2019). D. Roslund stated he was open to an ordinance which focused on ensuring

businesses coordinated their education and preparedness efforts with an agreed upon

community standard (personal communication, August 27, 2019). The bottom line is in

order for the visitor to be prepared, they have to first be aware.

Second, an emergency preparedness coordinator within the community can have

a positive impact on planning and preparation. At The Embarcadero, the Newport

emergency preparedness coordinator provided a majority of the information aimed to

educate the guests. Additionally, she has played a critical role in the education of the

employees (T. Newman, personal communication, November 21, 2019). D. Roslund

expressed that it is challenging to prepare without the support of a preparedness

coordinator. He even articulated that a part time employee that dedicated time between

multiple incorporated areas would "be light years ahead of where we are now" saying, "I

would love to have an emergency preparedness coordinator. I think this would be

important because the city would know what each sector of the community is doing and

were the city needs to focus its effort" (personal communication, August 27, 2019).

In incorporated areas were a dedicated emergency preparedness coordinator is

not present, the duty usually falls within the fire department, police department, or other

public service official. Additionally, the county emergency manager may have to support

any population that does not have adequate representation. However, as annotated in the

Cascadia Rising AARs, when emergency management becomes an additional duty, the

capacity of the community to respond becomes limited (FEMA, 2016). This is not because these people or the communities they serve are not capable, it is instead an indication that the time and resources needed to build an emergency capacity are not always available when the position is a "collateral duty" (FEMA, 2016, p. 6). However, it is easy to say a community needs an emergency preparedness coordinator, but sometimes difficult to create and fund such a position. This is why D. Roslund suggested that several incorporated areas could combine to support the funding of a position that could serve multiple incorporated communities (personal communication, August 27, 2019).

Third, a bayfront or similar business Community Emergency Response Team (CERT) program would be beneficial. The CERT concept was developed and implemented by the Los Angeles Fire Department in 1985 based on the recognition that citizens would likely be responding on their own during the early stages of a disaster (FEMA, 2011). The objective of the CERT program is to reduce emergency needs during the immediate aftermath of a disaster due to the leveraging of existing community resources until professional support is available. FEMA has concluded through several academic studies that organized community efforts are more successful if they are "woven into the social and political fabric of the community", and thus recommend using CERT to build a partnership between government and community leaders (FEMA, 2011, p. 3).

While the CERT program in Newport has made strides among neighborhoods (R. Martinez, personal communication, July 11, 2019), there currently appears to be nothing bringing businesses together on the waterfront. None of the three establishments were currently aware of what their neighboring businesses where doing, but they were

interested in bridging the gap. T. Newman stated, "I am aware of CERT, and think it is a great idea to implement a similar program on the bayfront as it is important to reach out and get involved with the businesses around us" (T. Newman, personal communication, November 21, 2019).

Finally, the hospitality industry has access to resources that can fill the two weeks ready void. D. Roslund stated that most lodging facilities have to give away tattered towels, linens, and blankets which could be used to stock caches. Additionally, the Overleaf Lodge and Spa runs a canned food drive every year that provides the number one source of food to South Lincoln Resources, a nonprofit corporation serving the south Lincoln County communities of Waldport, Yachats, Seal Rock, Tidewater, and Five Rivers (http://www.southlincolnresources.org). To achieve this, the Overleaf offers a 20 percent discount on your stay if four cans of food are donated. D. Roslund suggested that a similar food, or supply drive, could be utilized to stock caches (personal communication, August 27, 2019). The Cascadia rising AAR indicated that communities will have to employ creative and innovative solutions (FEMA, 2016), and D. Roslund noted, "there are plenty of opportunities for creativity" (personal communication, August 27, 2019).

SEMIFORMAL EMERGENCY MANAGEMENT

As I worked through my interviews with both the formal and informal sectors, I realized a major challenge presented was the coordination and organization between these two groups. Through the course of these interviews I was provided several contacts in the South Beach community of Newport where I was introduced to the semiformal sector of emergency management. Here, I was able to see first-hand how the community was able to bridge the gap

between the formal and informal sectors, and consequently make incredible progress with emergency management.

The semiformal sector contained six personal whom emergency management was not their primary occupation, but was a responsibility or focus within the boundaries of their primary occupation. For some, the focus was only inside the confines of their organization, and for others they were encouraged to expand their focus outside the organization to the greater community. Either way, all of them found themselves uniquely integrated into the emergency preparedness of South Beach, and Newport as a whole.

The only outlier of the group was Linda Kozlowski, a member of the Nehalem Bay Emergency Volunteer Corps. I felt her contribution best fit into this section, as she is not a formal government employee, but her involvement surpassed that of the informal sector primarily because the volunteer corps is now a designated nonprofit organization. Her experience also best aligned with that of the semiformal group in South Beach.

While the South Beach community experiences many of the challenges presented by the previous groups, they have managed to establish an evacuation plan and have two primary assembly areas with resources for both shelter and mass care at both. Although, they have not reached their goal of supplies for 5,000 people for three weeks, they are moving in the right direction. They recently reached their first major milestone of food, water, and medical supplies for 5,000 people for three days, with only shelter still incomplete. This section will explain the challenges they have faced, the strengths they relied upon to overcome them, and their proposed recommendations moving forward. When appropriate, what follows will also include observations from Linda through her experiences in Nehalem Bay.

Challenges Expressed by the Semiformal Group

The challenges presented by the semiformal group included initiating planning, educating the population, supporting a diverse community, building a cache, and finding and sustaining leadership. All these challenges were previously articulated by the formal and informal groups in some fashion, and all these challenges have been addressed by the semiformal groups in South Beach and Nehalem Bay. In some cases, they have found a way to overcome them.

The first challenge expressed was just getting started in the planning and preparation process. As stated by D. Anderson from South Beach State Park (SBSP), "you can't wait for someone to guide you through the planning, you just have to begin" (personal communication, August 09, 2019). L. Kozlowksi argued that the initiation of planning and preparing can be difficult, because there must be an event which focuses everyone's attention. For Nehalem Bay it was the winter storm of 2007 which isolated the community. This event served as the catalyst for building the Emergency Volunteer Corps of Nehalem Bay (L. Kozlowski, personal communication, November 13, 2019). Another notable recent event in Newport was the solar eclipse in 2017 which brought a large number of visitors to the community. D. Anderson communicated that it gave Newport an opportunity to come together and refine their Incident Command System (ICS) (personal communication, August 09, 2019.

A general consensus from the interviews is that planning starts with raising awareness and educating the population. C. Moffet argues that "education is everything right now because once the event occurs there will be no digital wayfinding or easy communication" (personal communication, July 22, 2019). However, with that, R. Fowler communicated that initiating the conversation with the public it not always easy or fun and is one of the greatest challenges. At HMSC, the visitor center identifies the facts of the hazard. R Fowler asserted that the response from the public is positive, with most visitors being receptive and thankful for the information,

noting that, "they feel that their personal preparation is empowering" (R. Fowler, personal communication, July 22, 2019).

C. Moffet said the hardest conversation is usually that, "Hatfield values one fatality over two. We do not tell people where to go, or what to do, but we give them information to make their own decisions" (personal communication, July 22, 2019). With the expected time between earthquake and tsunami, people may only have 15 minutes to evacuate, so any delay in their escape could be fatal. Based upon these discussions, it is my conclusion that the decision to delay evacuation should occur due to an informed decision to assist someone else, but in order to be informed, each person must be aware of the hazard and the necessity to evacuate immediately.

With the challenge of planning comes the requirement to support a diverse clientele. At the HMSC for example, there are faculty and students who are present for varying time periods, employees, volunteers, and public visitors. Each group has a different base of knowledge, resources, and needs, and, C. Moffet asserted that the facility is trying "to address the needs of each group" (personal communication, July 22, 2019). Everyone receives a hazard brief upon arrival and is given an evacuation map. Those who are there for an extended stay receive more extensive training and get to participate in evacuation drills. C. Moffet noted that, "we tell people if they are going (evacuating), they need to go loudly so people will follow who may not know what to do or where to go" (personal communication, July 22, 2019).

The same challenges of a diverse clientele apply to the resourcing of go bags and the South Beach cache. C. Moffet asserted that "each individual can make a better go bag for themselves, because they know their individual needs, such as food allergies, medicine, epi pins, and pet food" (personal communication, July 22, 2019). C. Rogers also communicated that "I am trying to build a cache for 5,000 people, but I do not really know about any of the special needs of these people" (personal communication, August 29, 2019). Essentially, the local community can

do the big things, such as providing water, generic food items, shelter, and medical aid, but they

cannot prepare for the diversity of special requirements that may be present in the population.

Visitors have to provide any specialty items themselves, which means they must be aware and

knowledgeable of the hazard and its impact.

Amassing and overseeing a general cache is not an easy accomplishment. C. Rogers

explained that just managing a cache for 5,000 people is a full-time job. He has to inventory

supplies, treat water, rotate out expired food items, and not to mention conduct a minor

excavation operation when the weight of one cache container caused subsidence (personal

communication, August 29, 2019). When asked about compiling a cache for the visiting

population, L. Kozloswki responded with this:

> "Compiling resources for mass care is a huge challenge. We have a plan, but we need to
> the get the community to buy in. It is a 10-15-year plan. It is overwhelming. The cities are
> not robustly staffed, they are small staffed cities without a lot of people working for them,
> they face huge challenges on a daily basis, and then you add long term food storage for
> thousands of people beyond the local population is monumental. It is overwhelming to
> attack" (L. Kozlowksi, personal communication, November 13, 2019).

For example, it took the South Beach community eight years to compile three days' worth of

mass care supplies for 5,000 people (C. Rogers, personal communication, August 29, 2019). I

would argue it is not remarkable that it took this long, but remarkable that the community

persevered.

The final challenge is leadership. L. Kozlowksi stated that you must have a champion or

group of people to carry the effort. The community will undoubtedly face obstacles, and someone

or some group must be willing to overcome them. Not only is it difficult to find the initial

champion, but the next step becomes leadership succession planning and finding the next

champion to keep the preparedness effort from fading away. L. Kozlowski explained that in the

beginning, structure is not necessary, but as the effort becomes more formalized and professional

their needs to be both leadership and organizational structure to continue to guide the operation forward, noting that "historically preparedness has been very episodic. People would be interested in a short period following events, then they would move on . . . [but] today's message seems to be more consistent with a more consistent interest" (personal communication, November 13, 2019). There is a dual challenge of identifying an initial leader or group to begin the preparation effort and maintain momentum. Both may take something dramatic (L. Kozlowski, personal communication, November 13, 2019), like an earthquake or a tsunami.

M. Dumas stated that it is difficult to implement an emergency ICS within some organizations due to the challenges of leadership. Most organizations are top down, but ICS flattens the organization by providing a "core set of doctrine, concepts, principles, terminology, and organizational processes that enable effective, efficient, and collaborative incident management" (FEMA, 2013, p. 1). M. Dumas reported that it can be difficult to get everyone to understand and agree that the person with the best information to make the decision may not be at the top, that "the greatest challenge within ICS is ensuring the right personalities are in the right role for ICS, and [acknowledging] this ICS role may not fit the organizational chart". The key is to use everyday incidents to identify talent for ICS and implement it. Effective ICS requires the empowerment of lower level leaders, which is developed through team building and the cultivation of trust (M. Dumas, personal communication, August 28, 2019).

I was surprised to find that the challenge expressed by the formal and informal groups of bridging the gap between businesses and formal emergency management was not articulated by those in South Beach. L. Kozlowski communicated that in Nehalem Bay, they just now started to get some business who are interested, and they need to take advantage of these efforts, asserting that "at first businesses did not even want to talk to our volunteer corps, but now they are at least willing to talk to us. We are trying to market ourselves as the safest place to visit on the coast, and

the business are fond of that motto. It is a challenge, but positive reinforcement is key" (L.

Kozlowski, personal communication, November 13, 2019). This is an obstacle that South Beach

may be overcoming.

Strengths Expressed by the Semiformal Group

The overall strength of South Beach is that they have a plan for evacuation, shelter, and

mass care of both the local and visiting population. While the preparations for the plan are not

complete and there are obstacles at every corner, progress is occurring, and the support group

appears to be growing. R. Fowler indicated that, "This [CSZ rupture] is not a new topic in the

South Beach community, there is a more proactive response than their used to be and that is

good" (personal communication, July 22, 2019).

The motivation for each of these people to be so involved in emergency management is

that it is formally or informally part of their job. For C. Rogers, safety and emergency

preparedness inside the Oregon Coast Community College (OCCC) are a part of his job, and the

college president is very supportive of the organization being involved in the greater emergency

preparation effort. He shared that "my boss is very supportive, and the college is very supportive

of my preparation efforts" (C. Rogers, personal communication, August 29, 2019). Similarly, C.

Moffet stated the director of HMSC had given her permission to support the community effort for

South Beach and that "supporting the community effort in South Beach is work, it is part of my

job" (personal communication, July 22, 2019). Furthermore, places like the Oregon Coast

Aquarium (OCA) and SBSP have large visiting populations and visitor safety and emergency

preparedness go hand in hand.

This involvement has led to extensive coordination and organization within the South

Beach community and to Newport overall. C. Moffet said the number one strength for the HMSC

is "understanding where HMSC fits into the cogs of emergency management" (personal communication, July 22, 2019). She understands what resources she has, what resources are at each echelon, and who she can reach out to in order to coordinate for them. M. Dumas reinforced the idea that knowing your role and where you fit in the big picture streamlines communication (personal communication, August 28, 2019). Maybe most important, every level of preparation takes the burden of the next level, and the coordination of this preparation with higher echelons will enable the city and county to prioritize their efforts.

Just as leadership was a challenge in other areas, leadership in South Beach appears to be what is enabling the coordinated effort. While HMSC may be keeping "the ball up in the air" (C. Moffet, personal communication, July 22, 2019) with respect to emergency preparation, there is a cohort of champions, as L. Kozlowski noted, that are working to ensure the ball keeps moving forward. For example, the South Beach Community Planning Group is a self-selected, self-organized group, via word of mouth, with an interest in volunteering. They include individuals from HMSC, OCA, SBSP, OCCC, as well as other private businesses and community members in the area. C. Moffet, whom appears to be heading the operation, comes at the challenges of leadership from a nonauthoritative angle. She is simply a representative of HMSC. Though she understands that there are benefits of being associated to OSU and HMSC as these connections provide some legitimacy to her name, the group appears to operate informally. They never ask members to do anything, but provide support if and when they can (C. Moffet, personal communication, July 22, 2019). I suppose this could be the reason the support of planning and preparation in South Beach is so high. The community already has a self-organized cohort, and all you need to do is show up and volunteer in whatever capacity you can. This arguably takes significantly less effort. However, this is just hypothesis that could be investigated.

These efforts are not C. Moffet's alone. D. Anderson articulated that, through the park systems, there is a culture of sharing, and they simply brought that culture to South Beach. This means South Beach not only gets the expertise of the park staff, but they have access to the information shared from three other regions and their districts (D. Anderson, personal communication, August 09, 2019). M. Dumas stated that it's all about "getting creative and just working around the obstacles in place" (personal communication, August 08, 2019). For example, the OCA is a nonprofit, so they have very little money to pour into community preparedness, but they have worked collaboratively with the cache assemblage by donating items such as old uniforms. Other organizations have conducted blanket drives, Rogue Brewery canned water, SBSP donated freeze-dried food, and NOAA donated medical supplies.

M. Dumas articulated that the most important thing is for everyone to collaborate and continue the progress with planning and preparation (personal communication, August 08, 2019). C. Rogers said one of the ways they have maintained momentum in the planning group was through the development of a cache building roadmap (personal communication, August 29, 2019). This roadmap allows them to make minor goals, recognize small victories, and ultimately step back to see how far they have come.

As the process of cache building continues, the community has refined their evacuation procedures through extensive rehearsals. C. Moffet asserted "we have a plan and we have rehearsed" (personal communication, July 22, 2019) and that rehearsal is the key to evacuation success. "Those that have drilled are lock step with agent-based modeling, but those that have not drilled were not on pace" (C. Moffet, personal communication, July 22, 2019). Agent-based modeling is a way to investigate how decision time to evacuate, speed of travel, modes of transportation, and distance to safety impact the ability of a person to evacuate successfully (Wang et al., 2016). These models help determine how long people can wait before evacuation

and how quickly they must travel once evacuating given a specific tsunami situation. Agent-based models have been used to identify evacuation routes and predicted evacuation time along the Oregon coast.

Similarly, M. Dumas could not overemphasize the importance of drills and rehearsals. Coming from both a school and emergency management background, she stated that "Drills are so important, they are very important, and mostly they get you to work with each other and become comfortable with each other" (M. Dumas, personal communication, August 08, 2019). R. Fowler added that you could feel the community come together during the evacuation drills (personal communication, July 22, 2019).

SBSP had extensive evacuation drill experience. The park brought in volunteers to simulate a large visiting population in an effort to test their signage and routes. They initially had varying assembly areas and evacuation routes based upon a visitor's location in the park. The goal was to get everyone to safety via the shortest distance. However, the plethora of routes and the decision-making process needed to navigate them proved to be confusing and time consuming. They now have one assembly area, and few simple routes. The rehearsals allowed them to see that topography does not always provide the best answer. People tended to evacuate faster when they had to make less decisions, even though the distance may have been longer (D. Anderson, personal communication, August 09, 2019).

Therefore, while the South Beach Community faces similar challenges expressed in both the formal and informal sector, they have mitigated some and overcome others in order to have a community plan for evacuation and mass care. While they acknowledge that they have a long way to go, they have recommendations to make the path a little easier. These recommendations may be applicable to other parts of Newport, or other coastal communities.

Recommendations Presented by the Semiformal Group

Based upon their experience the semiformal group expressed five recommendations: educate the visiting population, ensure each individual or business understands their role in emergency management, educate and prepare waterfront employees to evacuate and respond, conduct extensive rehearsals, and look at the broader concept that emergency management may begin in the classroom.

In order to increase the resilience of the visiting population and the coastal communities they visit, the number one recommendation from every person interviewed was raising awareness and educating the population, both local and visiting. At the HSMC C. Moffet and R. Fowler believe that knowledge is power in a situation like the potential Cascadia earthquake (personal communication, July 22, 2019). The community can build caches and businesses can prepare go bags, but this will only go so far in preparing for a robust and diverse visiting population.

Additionally, it is indicated that people often need "two pieces of information before they [decide] to evacuate" (Wood et al, 2019, p. 508). If they are not aware that the earthquake will trigger a tsunami, then the first evacuation trigger will fail. This may lead to departure delays and much higher numbers of casualties in the visiting population. C. Moffet believes that the second trigger should be people evacuating loudly (personal communication, July 22, 2019), but these loud evacuators must know to evacuate in the first place.

D. Anderson articulated that when educating visitors, we should stick to the facts and build off of the engrained emergency preparedness training they already have. Start with what they are most likely already doing, such as roadside emergency car kits, and then help them make the additions and or changes to their plans and preparations for the hazards of the Oregon coast. D. Anderson also demonstrated that at least for SBSP, raising awareness and educating the

visiting population has not negatively impacted the numbers of visitors to the park. In fact, as

hazard signage has increased in the park and hazard information has become an integral part of

the general welcome message, the number of visitors has increased (D. Anderson, personal

communication, August 09, 2019).

The second recommendation – that every individual or business should understand where

they fit into the emergency management plan for the city of Newport can only happen if the first

– adequate education – is prioritized. The goal is for the formal sector to be able to coordinate and

organize a citywide effort, but for this to be successful a majority of the people, businesses, and

communities within the municipal boundaries must know what they have and what they need.

This gives the emergency preparedness coordinator an accurate picture of the whole jurisdiction

and then allows them to prioritize their effort.

Several interviewees said the information is already available and, in some cases,

promoted with respect to the hazard. C. Moffet suggested the public knows about the CSZ and the

accompanying message will impact preparation, relating that "providing the information in a

positive fashion is empowering. Tell people about the hazard, its characteristics, and what they

can do for themselves and for the community" (personal communication, July 22, 2019). As a

response, L. Kozlowski looks for people in the community who are preparing and then

"advertises the hell out of [them]" (personal communication, November 12, 2019). She asserts

that the message to the businesses and the visiting population that supports them can be a positive

one: "It is a cultural change, tsunamis are a reality, so why not visit a place that is prepared . . .

[and] market ourselves as the most prepared place to visit on the coast" (L. Kozlowski, personal

communication, November 12, 2019).

C. Rogers argues that the preparation message is a constant challenge, and the

community "needs more people involved, [because] more people equals more support and more

knowledge and resources (C. Rogers, personal communication, August 29, 2019). However, the

good news is progress is happening, and "people are aware, they are preparing individually, and

beginning to prepare as a community, and preparing as a community is a good place for Newport

to be" (C. Moffet, personal communication, July 22, 2019).

While educating the visiting population is a viable goal, there are inherent challenges to

ensuring the education of a perpetually changing group of people who are presumably more

concerned with enjoying themselves than preparing for a natural hazard. M. Dumas thinks the

remedy may be focusing on having an educated staff who can respond to the event and ensure the

visiting population can evacuate effectively. This begins with educating and training the

employees of businesses within the inundation zone. If the employee cannot secure themselves

first, then they cannot be expected to help others. Therefore, training this population can enable

them to help themselves and help others (M. Dumas, personal communication, August 28, 2019).

R. Fowler would like to see a customer service training module for the Oregon coast, or

one specialized for each community. This module could focus on the emergency preparedness

and response for all employees, so restaurants and hotels can support each other and the visiting

population they interact with on a daily basis. The training would benefit from some level of

standardization, in order to ensure a consistent multijurisdictional message (R. Fowler, personal

communication, July 22, 2019). I am aware of the TsunamiSafe online awareness training

specifically developed for the Oregon coast by OEM, but it appears that the training is not being

utilized in an effectual manner. V. Demaris communicated that while the training was made

available, the demand did not reciprocate (personal communication, July 22, 2019). An area of

future inquiry could be determining why the module is not being successfully implemented.

The recommendation that appears to be making the most positive impact in the

community is the implementation of both single venue and joint multi agency full-scale

community wide evacuation rehearsals. Participants have claimed these events raise awareness, bring the community together, and those business or people who have rehearsed appear to be able to reach safety more efficiently. Additionally, M. Dumas feels the rehearsals need to be designed to prevent an automatic response through the implementation of obstacles. This will force people to think through real evacuation issues before they actually occur. This type of scenario injection, combined with multi-agency rehearsals, is important for the CSZ event because the resulting environment is relatively unknown. Everyone will need to be flexible and able to work with each other to overcome any pending obstacles (M. Dumas, personal communication, August 28, 2019).

M. Dumas, noted that establishments might take advantage of everyday events to rehearse and refine their individual ICS, but large scale planned community wide rehearsals should be added to the calendar as well, noting that "community preparedness efforts can help get people as individuals to prepare and it allows people to get to know their neighbors and help each other be more individually prepared" (personal communication, August 28, 2019). My takeaway from this discussion was that there appears to be a reciprocal relationship between the individual and the community during a rehearsal, and this relationship enables the preparation effort to gradually include a larger number of people and gain momentum.

The last recommendation had to do with the larger question of how you improve resilience in populations overall. One suggestion was that resilience starts in schools. M. Dumas explained that based upon her experience, rehearsals in one location transferred well to varying situations in other locations. This same general conclusion was evident at SBSP, as park rangers found the best method to reach visitors with preparedness was to start with a traditional system such as the American Automobile Association (AAA) car emergency kit and build from there (D. Anderson, personal communication, August 09, 2019). Therefore, a foundational understanding

of emergency preparedness and response that is taught in schools through education and drills may lead to better prepared adults (M. Dumas, personal communication, August 28, 2019).

MY INITIAL REFLECTION FOLLOWING INTERVIEWS

The problem with the visiting population is complex. They are a critical piece of the economy, but local communities like Newport lack some of the necessary resources to support them during a CSZ rupture. Any preparation effort that can help communities move closer to two weeks ready is beneficial. Even a hotel-provided evacuation map and go bag may give a person two to three days, which is time to organize themselves, and time for the community to organize its response. Even with such a huge challenge in front of these communities, it is comforting to know that volunteers such as G. Schmit envision a community of survivors opening their doors to the visiting population, saying "people will help, it is not human nature to turn away a person in need" (personal communication, July 11, 2019).

At the end of my interviews with the formal, informal, and semiformal sectors it was evident that progress in emergency preparedness for a CSZ rupture was happening, albeit at different rates in different spaces along the coast, and within the City of Newport. In some places the formal sector struggled to coordinate with the informal, in other places the informal sector struggled to reach the formal, and in South Beach the emergence of a semiformal emergency management sector is able to bridge the gap between the two. The good news is planning and preparation are moving forward, but the reality is there is still a lot of work to be done to ensure the visiting population in these coastal communities will be able to be self-sufficient for two weeks.

CHAPTER 6 – DISCUSSION AND RECOMMENDATIONS

The National Planning Frameworks put forth by FEMA describe how a community can work together to achieve the goal of preparedness through its five overlapping mission areas or phases of prevention, protection, mitigation, response, and recovery (https://www.fema.gov/national-planning-frameworks). However, when a disaster occurs, we tend to focus on the response, and often the failures in response, because we have the opportunity to watch it unfold in real time. The reality is that our preparedness failures often occurred during mitigation, when we failed to understand the characteristics of the hazard or the vulnerability of the populations and the systems that support them.

The CSZ hazard itself presents a myriad of challenges associated with its characteristics. First, "unlike hurricanes which are polite, earthquakes provide no warning" (A. Rizzo, personal communication, August 08, 2019). This means evacuation of the coastal communities before the event will be next to impossible. Second, the likely scale of the hazard means the impact zone will transect two nations, at least three states, all 36 of Oregon's counties, and extensively effect the incorporated and unincorporated areas of each coastal county. There is also the dilemma that the most populated region in Oregon, the Willamette Valley, will likely demand extensive resources (Thompson, 2010). This means that federal, state, and county resources will have to be prioritized and distributed amongst multiple populations across a vast and diverse impact zone. This will take time, and if the Cascadia Rising Exercise provided any indication, difficult decisions will need to be made with respect to the prioritization and distribution of life-saving and life-sustaining resources, which brings about the characteristic of duration. The earthquake will last minutes, the tsunami waves will propagate for hours, but coastal communities such as Newport may be isolated for weeks.

Newport's isolation is due to the physical geography of the Oregon coast and vulnerability of the infrastructure that supports these coastal communities. Lifeline degradation and the creation of islands due to the lack of infrastructure will limit the circulation of people, goods, services, and information (Platt, 1991; Thompson, 2010; Ashford, 2016). What that community has at the onset of the earthquake will likely be all they will have to perform rescue and relief during the first few weeks following the event. This means a population's ability to respond relies on their ability to evacuate the inundation zone, and then resource shelter and mass care for an extended period. Those that are not able to, either by situation or choice, are consequently vulnerable. This paper concludes that one such vulnerable group is the visiting population due to their lack of knowledge and resources, which is largely a consequence of their social position in the community. The question then becomes what the visiting population can do and or what the community of Newport can do, to reduce this vulnerability? Table 6.1 summarizes the key takeaways from my content analysis of the preparedness literature, as well as the challenges, strengths, and recommendations from the group of interviewees. My suggestions attempted to operationalize these recommendations.

Table 6.1. Table displaying a summary of the findings discussed in Chapter 4 and 5.

Content Analysis Key Takeaways	1. Community should develop capacity to respond locally . . . independent of support 2. Visiting population should be accounted for in EOP with specified requirements and goals for evacuation, shelter, and mass care 3. Local population should be formally operationalized in planning documents		
Group	**Challenge**	**Strength**	**Recommendation**
Cascadia Rising AARs	1. Capacity to respond locally 2. Efficiency in vertical and horizontal integration using NIMS 3. Ability to provide shelter and mass care for entire population	1. Local emergency managers and their previously forged relationships	1. Utilize local assets 2. Provide mass care with limited outside support 3. Employ creative and innovative solutions to overcome inherent challenges
Formal	1. Avoid apocalyptic message and discern real risk from perceived risk 2. Provide clear and consistent preparation message across jurisdictions and through echelons 3. Ability to evacuate, shelter, and provide mass care for visiting population 4. Build trusting relationship with hospitality industry	1. Capacity of local people to cope and adapt 2. Geography of Newport results in small inundation zone 3. Progress is occurring with planning and community leaders are dedicated to preparedness	1. Harden infrastructure for evacuation, shelter, and community lifelines 2. Provide a clear and consistent message for hazard education and preparation 3. Operationalize the hospitality industry 4. Introduce supporting legislation
Informal	1. Balanced message to enable education and preparation without invoking fear in customer 2. Educating and training their own organization 3. Coordinating their preparedness effort with the community	1. Demonstrated commitment of these businesses to prepare 2. Ability to publicize businesses efforts to increase preparedness	1. Educate visitors on hazard so they can prepare 2. Emergency preparedness coordinator for each municipality 3. Develop a waterfront CERT program 4. Utilize resource capacity of hospitality industry to build caches
Semiformal	1. Initiating planning 2. Educating and supporting a diverse population through evacuation and mass care 3. Building a cache to support a vast visiting population 4. Leadership now and leadership continuity to sustain progress	1. Have plan for evacuation, shelter, and mass care in South Beach 2. Preparedness is part of their job 3. Leadership within community 4. Implemented business and community wide rehearsals	1. Educate the visiting population 2. Individual, business, and community integration into city EOP 3. Operationalize waterfront employees to aid in evacuation effort 4. Conduct rehearsals 5. Preparedness starts in schools

SUGGESTIONS TO INCREASE NEWPORT'S RESPONSE CAPACITY

In these suggestions, I focused on what I believe the community of Newport can do for the visiting population given the recommendation for communities to look internally for creative and innovative solutions in preparedness and then plan on having limited outside support for shelter and mass care. I also focused on the response mission with its two submissions of rescue and relief. First, I think Newport should prioritize its preparation effort for (1) successful evacuation of the inundation zone, (2) providing shelter and mass care for 30 days, and (3) finally transport the visiting population out of the community. Second, I recommend the community look to educate the visiting population while simultaneously building a response capacity with waterfront businesses and their employees. Finally, I recommend utilizing the city's schools as relief centers as this has been demonstrated to improve community resilience and promote a healthy emotional recovery process (Mutch, 2014/2016; Ronan and Johnston 2005; Thompson, 2008).

Before moving onto evacuation, I would like to address the conundrum of educating a customer on the potential hazards of doing business at a specified location. Previous research in other tsunami zones proposes that it can have a positive impact on both the business and the customer if done correctly. Rittichainuwat and Chakraborty (2012) concluded that a crisis management plan could successfully be used as a marketing tool for current and future customers. Visitors also claimed that two of the most important safety measures to them during their visit was a hazard guide in their guest room and an evacuation warning in multiple languages (Rittichainuwat, 2013). Additionally, the same research suggests that "tourist destinations whose local authorities and hotels have a written crisis management plan and actively implement it recover better and faster than do their counterparts" (Rittichainuwat, 2013).

Essentially, research proposes that having a tsunami evacuation plan and providing it to your customers may improve economic output before the hazard and increase efficiencies in

recovery following the hazard. Not to mention the customer will be educated and prepared to mitigate the potential risk. This information aligns with the observation that as tsunami planning and visitor education increased at SBSP, so did the number of visitors who frequent the park (D.Anderson, personal communication, August 09, 2019). A. Rizzo also concluded that as CSZ awareness has increased, so have tourist numbers on the Oregon Coast (personal communication, August 08, 2019). While there is not enough data to support causation, this correlation may suggest that raising awareness does not deter people from visiting the coast.

Evacuation

Over 90 percent of the casualties during the 2011 Japan earthquake were due to drowning (Nakahar and Ichikawa, 2013) and many of the casualties from both the 2011 Japan and 2004 Indian Ocean earthquakes can be partially attributed to the inability of people to evacuate the inundation zone. Further, previous research has advocated that one of the most efficient and effective means to reduce fatalities in a tsunami inundation zone is successful evacuation (Mostafizi, Wang, and Dong, 2019). However, recent research has also suggested that departure delays (Wood et al., 2019), milling time (Mostafizi et al., 2019), or believing a location was safe from the hazard (Yun and Hamada, 2015) were all behavior factors negatively impacting successful evacuation. Departure delays are any reason why a person or group may not evacuate immediately, such as turning on a radio to obtain information on the shaking to determine if evacuation is necessary (Wood et al., 2019). While milling time is moving around, often by a group in a confused mass, instead of deliberately navigating along an evacuation route or to an assembly area (Mostafizi et al. 2019). Therefore, effective tsunami evacuation is connected to the awareness of the hazard and its potential impact on your location, knowing when to initiate evacuation, and the knowledge of the evacuation routes and assembly areas available. All of this

can be accomplished for the visiting population through education, training of the local

population in the hazard zone, and rehearsals.

First, the visiting population must understand where the inundation zone is and whether

they are located within it, if at all. Newport, and the Oregon coast in general are placing tsunami

evacuation signs on beaches and in state parks, and cities like Newport are implementing the blue

tsunami line to show people once they have reached safety. These are great steps forward but do

not give visitors an opportunity to plan ahead.

A confirmation email from a hotel or campground following a reservation could link

visitors to the Oregon Tsunami Clearing house

(https://www.oregongeology.org/tsuclearinghouse/visitors.htm) which provides a seven step

model for coastal visitors to prepare for their trip. The first step is locating your lodging facility or

places you plan on visiting. The second is to determine whether these places are in the inundation

zone and subsequently identifying associated evacuation routes. This resource also offers a

connection to NANOOS Visualization System (NVS) Tsunami Evacuation Zones

(http://nvs.nanoos.org/TsunamiEvac), a website which provides a detailed map with inundation

and evacuation information. A link to this website could also be added to the Discover Newport

webpage (https://discovernewport.com) managed by the chamber of commerce, as well as other

likely visitor internet destinations.

The information for successful evacuation is available, but the challenge as a visitor is

knowing where to find it? A role of the community should be to connect the two. NVS also

provides a GPS enabled smartphone application that can be downloaded and referenced

throughout a visitor's trip. While cell service is predicted to go out immediately following the

earthquake, previously downloaded maps could be used in conjunction with GPS services on the

phone to better enable post-earthquake wayfinding. While this is not currently available on the

NVS application, it is an established technology being used in other smartphone mapping applications.

The challenge presented with an evacuation message is consistency from facility to facility and community to community. Visitors traverse the entire coast, so it is important that the message is synchronized across jurisdictions. A city ordinance would enable consistency within the jurisdiction of Newport to ensure businesses communicated the hazard to their customers along with published evacuation routes. Multijurisdictional communication would fall between county emergency managers and Oregon's OEM to ensure that the message is consistent with current scientific facts and/or assumptions as well as the goals of each community. Based upon the recommendations put forth in the *Oregon Resilience Plan*, support for such an effort would be available. In regard to improving education efforts the plan recommends that all hotels, motels, and rentals in the inundation zone should provide CSZ information and evacuation routes, and that all businesses over a certain size (size was not determined) in the inundation zone should have an actual evacuation plan (OSSPAC, 2013).

While educating the visiting population is useful, the reality is it will be difficult and there are no guarantees that the information provided will be absorbed and or used. Therefore, the education and training of the businesses and employees that co-occupy the inundation zone would be both doable and quantifiable. Additionally, this effort could reduce the vulnerability in both visiting and non-visiting populations. Departure delays and milling were two primary reasons for people becoming casualties in a tsunami. One common reason for departure delays is that people often need two reasons to evacuate (Wood et al., 2019). In Newport, the ground shaking could be the first and then the local population identifying and communicating the way to safety would be the second notification to evacuate for the visiting population (C. Moffet, personal communication, July 22, 2019). Additionally, following someone to an assembly area is likely

easier than having to way find yourself in an unfamiliar environment, mitigating the tendency to mill.

Positive reinforcement is the recommendation from the community for achieving the goal of education and training. R. Martinez suggested that businesses could be labeled tsunami ready once they achieve a certain level of preparedness and training. Similarly, employees could achieve a "tsunami-ready" status with a diploma for graduating a tsunami course and the diploma could be displayed in the workplace (personal communication, August 20, 2019). The goal would be to empower those in the inundation zone by providing them with an understanding of the hazard and a means to mitigate the risk. As Regina Martinez says, "be prepared, not scared" (personal communication, August 20, 2019).

The last piece of effective evacuation is rehearsing. As a member of the military, I have witnessed a multitude of personal and organizations conclude that they were prepared for execution only to stumble through a full force rehearsal. Those groups in this paper whom conducted extensive rehearsals also concluded that they were fundamental in their achievement of successful evacuation. Most important was the realization that map based evacuation routes were not always the best option, routes had to be walked by real people to ensure effectives. The bottom line is that "even the best plan, if not rehearsed, has a great potential for failure" (Tillman, 2012).

Maybe the most important aspect of the rehearsals was the realization that the rehearsal had a reciprocal relationship of helping both the community as a whole and each individual who participated. The rehearsals encouraged community wide organization and coordination (M. Dumas, personal communication, August 08, 2019; Renee Fowler, personal communication July 22, 2019), and those individuals that had previously rehearsed were in turn "lock step with agent-based modeling" (C. Moffit, July 22, 2019) enabling them to reach safety in time. Each

establishment should conduct their own individual rehearsals on a quarterly or semi-annual basis. I understand every business has its own competing priorities, but for reference ORS 336.071 (emergency drills and instruction) mandates that all schools in a tsunami hazard zone must spend at least 30 minutes per month instructing students and faculty on evacuation and must conduct at least three evacuation drills per year.

In addition to individual rehearsals, each community should conduct a community wide rehearsal to their respective assembly areas at least annually. The "Great Oregon ShakeOut" which takes place on the third Thursday of October every year would be a great date for the City of Newport to designate as an area-wide rehearsal. Rehearsals are difficult, because there is never a good time for everyone. However, as stated by Tyler Newman from his experience in the U.S. Coast Guard, "most people dislike training until the real emergency happens", then they are thankful they participated (personal communication, November 21, 2019).

Schools as Relief Centers

The first step may be getting out of the hazard zone, but the problem then becomes were to evacuate to? Oregon's CERT program encourages neighborhood readiness for the local population, but this still raises the question of where to put an extra 20,000-30,000 visitors. The shelter and mass care of a large visiting population was a challenge expressed in the Cascadia Rising AAR and by each interview group. Furthermore, the semiformal group which had begun extensive cache building expressed that resourcing a physical shelter was one of the most expensive and difficult tasks to accomplish. Thus, the question is whether the homes of the local population are suitable for the sheltering of the visiting population or would a public relief center better serve this demographic?

Traditionally, research suggests "that evacuees tend not to use public or planned shelters" (Perry, 1985, p. 146). However, according to Perry, Lindell, and Greene (1981) and Perry (1985) sheltering behavior of evacuees has differed based upon the individual, the community, and the hazard itself. First, evacuees prefer to stay with family or friends if possible. If both transportation ability and warning time allow, evacuees will choose their home or a family member's home (Perry, 1985). As both transportation ability and warning time decrease, evacuees next begin to seek out friends in the vicinity (Perry, 1985).

While friends and family are preferred, several factors begin to contribute to the use of public relief centers during a disaster. When warning time is short, such as during a quick on set hazard, or when community preparedness is low, public relief center use increases (Perry, 1985). If destruction from the hazard is high and if evacuees are not well integrated into the community, then public relief center use increases (Tierney, Lindell, and Perry, 2001). Additionally, in communities where preparedness is very high, or the entire community needs to be evacuated and the anticipated shelter time is long, the use of public relief centers also increases (Perry, 1985; Perry et al. 1981). Drabek (1986) also suggested that while people may not stay in a relief center if family or friends are available, they will use the relief center as a "shelter checkpoint" (Perry, 1985, p. 148) to receive information or support on their way to their final destination. These scenarios closely resemble the predicted situation for both the local and visiting population in Newport. Thus, suggesting that public relief centers may be necessary and utilized.

Previous studies have advocated that schools are a desirable choice for communal relief centers aiding both response and recovery within the community (Thompson, 2008; Mutch 2014/2016; Ronan and Johnson, 2005). "There is a place for schools in all phases of the disaster process . . . schools have both the physical facilities and the personnel to respond quickly to an emergency" (Mutch, 2014, p. 19). 80 percent of the schools in Japan were upgraded to earthquake

proof prior to the 2011 earthquake and tsunami, consequently making them an integral part of the community after the event for both shelter and recovery. This effort also reduced the estimated number of direct earthquake casualties to only 100 (Mutch, 2014).

Following the 2010-2011 earthquakes in Canterbury, New Zealand a similar pattern was observed. Immediately following the earthquakes evacuees "came to sleep . . . get water . . . use toilets . . . get hot food . . . or get information" at schools (Mutch, 2016, p. 123). "Long after their formal use as drop-in centers, families and community members continued to visit their local school for companionship, emotional support, and advice" (Mutch, 2016, p. 126). Other studies have supported these observations, even concluding that allowing children to return to school as soon as possible is an essential part in community recovery (Ronan and Johnson 2005). Although not specifically designed, the schools in the Canterbury region of New Zealand became the community glue that enabled immediate shelter and long-term recovery following each earthquake. Consequently, Mutch recommended that the "location, design, and capacity of school buildings" (2016, p. 135) should be considered with the dual purpose of education center and relief center in mind.

For Newport, the location, design, and capacity of its schools could enable a successful sheltering, and if previous research is any indication the "emotional, social, and psychological" (Mutch, 2016 p. 115) support for effective recovery. Community support during the recovery effort should not be overlooked, especially due to the anticipated recovery times outlined in the *Oregon Resilience Plan.*

> "Schools are likely to become a major refugee and triage centers in the immediate aftermath of a Cascadia earthquake and tsunami, but from the standpoint of business recovery, schools are primarily important as a place where workers' children can spend their days, thus freeing up parents to return to work" (OSSPAC, 2013, p. 26)

First, all of Newport's schools are located outside of the tsunami inundation zone, and several of them are already designated as assembly areas according to tsunami evacuation maps produced in coordination between DOGAMI and the City of Newport (https://www.oregongeology.org/tsuclearinghouse/pubs-evacbro.htm). Additionally, when including OCCC there are school facilities in both Newport North and Newport South that can be utilized as relief centers. In fact, OCCC geographically correlates with the visiting population in South Beach and Yaquina View Elementary geographically correlates with the visiting population of the Historic Bayfront. Both heavily trafficked areas for visitors. However, a point of concern is that predicted lifeline degradation may prevent those individuals north of Big Creek from accessing one of the presently located schools (Figure 6.1). A solution may be prioritizing the hardening of this piece of transportation infrastructure, or placing a two to three-day cache north of Big Creak to serve the population until the water subsides and they are able to travel south to a relief center.

The design of the schools in Newport is not quite ready for relief center status. Several of the schools in Lincoln County are seismically rehabilitated and others are in the process of being upgraded to help students and staff safely evacuate after an earthquake. However, they have not been retrofitted to re-occupancy standards to enable the schools to be used for shelter purposes (S. Graves, personal communication, September 03, 2019). This is largely because the current Seismic Rehabilitation Grant Program (SRGP) through the State of Oregon provides funding to retrofit schools to a life-safety seismic standard for evacuation, not a relief-center seismic standard for reoccupation. However, some communities in Oregon, such as Beaverton, have chosen to upgrade the schools themselves. Beaverton passed a 680 million-dollar bond in 2014 which aims to help construct seven schools in the community that will serve a dual purpose of education center and earthquake relief center (CREW, 2018). This is a large cost for a small community like Newport that has five schools if OCCC is included, but with a long-term

adaptation approach, retrofitting one school at a time may be feasible. It may also be worth

bringing this discussion to the State level, with the intent of updating the SRGP to a enable

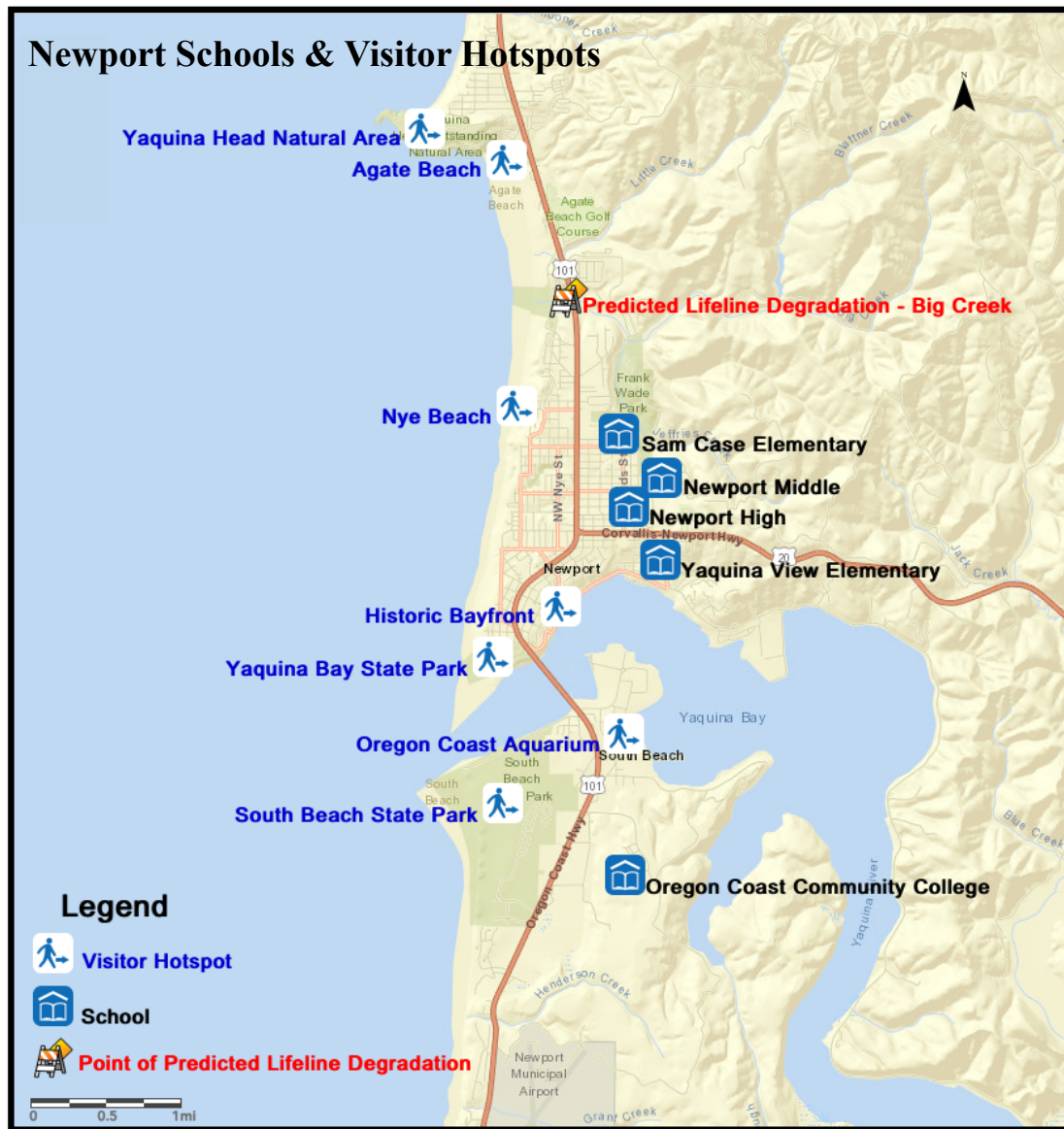retrofitting to a reoccupation seismic standard.

Figure 6.1. Map of schools in Newport and potential visitor hotspots. A point of interest may be the potentially isolated hotspots of Yaquina Head and Agate Beach due to predicted lifeline degradation at Big Creek. Figure created by author with information from (Cascadia, 2016).

The capacity of the school to act as a relief center is actually well under way. Currently

every school has a disaster cache to meet the basic needs of both the students and staff at the

schools. Additionally, if the earthquake were to occur when school was not in session, the disaster

caches have been coordinated to be utilized by the associated fire district and or city (Newport,

Lincoln City, Toledo, Waldport) (S. Graves, personal communication, September 03, 2019).

Fortunately, the academic school year coincides with a low visiting population, and the summer

months correspond with a high visiting population while school is out of session. Therefore, the

current disaster cache is serving two populations simultaneously.

Although, some schools are designated as assembly areas on a map, presently they are

not actually included in a citywide evacuation and shelter plan (R. Martinez, personal

communication, August 20, 2019). If they were integrated into a community wide plan, each

school could then work to build their cache off of both the student population and an estimated

evacuee population for the given area. This would need to be a community wide effort, not the

sole responsibility of each individual school. This is where a waterfront CERT program could

bridge the gap between the community and the school. Each waterfront team could collaborate

with a designated school for rehearsals and cache building. An example paring would be the

Historic Bayfront and Yaquina View Elementary. Currently the school is already the designated

assembly area for that zone on the DOGAMI published tsunami evacuation map, but coordination

and collaboration has not occurred to my knowledge.

Furthermore, one of the conclusions from the Canterbury earthquakes in New Zealand

was that teachers ended up being first responders although they had no training. A

recommendation was that school leaders needed to be provided education and training in order to

better serve in an emergency response and recovery capacity (Mutch, 2016). The Oregon

Resilience Plan recommends "an earthquake/tsunami curriculum to Oregon's school[s]"

(OSSPAC, 2013, p. 54) and currently, the entire Lincoln County school district offers a semester

long class called Teen CERT for its high school students which focuses on preparing students to

respond to disasters when professional emergency responders are not readily available (S. Graves, personal communication, September 03, 2019). This enables the high school students to be better equipped emergency personal within their community and within the school itself. Therefore, the school system itself has a cadre of personnel that are educated, and if properly trained and integrated with the faculty, could support a community wide rescue and relief effort.

One of the recommendations from Mutch (2016) was that the school and the local community need to collaboratively develop disaster plans which include evacuation, shelter, and long-term recovery, and specify the role the school will play in each. The current issue is that there appears to be limited coordination between the schools and local community of Newport. The schools are prioritized with funding within the State of Oregon and are working diligently to ensure the safety of the students and faculty. This effort presents a great opportunity for Newport to support and simultaneously integrate preparations to build a city-wide shelter and mass care plan supporting overall community resilience. Given the fact that the city does not currently have a shelter and mass care plan, collaborating with the school district would be a great place to start.

Transport of Visitors out of the Community

The actual transportation of visitors out of the community may not be something that Newport can impact immediately due to the fact it will require the hardening of county, state, and federal infrastructure. Another factor is that air support to deliver lifesaving and life sustaining resources as well as evacuate personal will also come from jurisdictions outside the city. However, the community can decide and develop a plan on how they wish to prioritize and organize the transport of people out of the community. Previous research has suggested that, because visitors will likely be dependent on local supplies until they leave the area, "developing post-disaster strategies to transport tourist out of the disaster area as soon as possible" could increase port and harbor community resilience (Wood and Good, 2004, p. 255).

The first priority of transport will be a trauma or triage-based approach for those personnel who need medical attention (K. Jacobson, personal communication, July 17, 2019). Following this group's evacuation, the next group should be visitors as they will require extensive local resources, likely be separated from their family or social support group, and not play a significant role in recovery. As stated by Thompson (2010) the first aircraft will likely deliver relief supplies and upon departure evacuate as many casualties as possible. However, at some point the priorities will shift once all casualties have been evacuated. This is not the time to develop a plan to ensure visitors are loaded ahead of less critical equipment. The transition should be as seamless as possible to ensure efficient delivery of relief and transport of personnel. Additionally, no aircraft should enter or depart from the city without supplies or personal in need of transport.

The likelihood of air transport also highlights the potential for schools as relief centers. Thompson (2008, p. 45) concludes that "relief centers should have enough open space to allow for landing aeromedical evacuation helicopters". School sports fields and parking areas could offer this open space. The evaluation and if needed excavating of these open spaces to prevent subsidence during the earthquake could be incorporated in the retrofit budget.

CHAPTER 7 – CONCLUSION

LIMITATIONS AND FUTURE RESEARCH

One thing I learned in this project, and really through my academic journey overall, is that no solution is perfect, it is merely a suggestion based upon presently available information and is usually riddled with limitations. This project and my recommendations are no different. I had a brief opportunity to interact with a community and its members and subsequently provided a few recommendations based upon what I read, heard, and saw. This section covers the limitations I encountered and then recommends areas of future research.

As discovered in some disaster vulnerability research initiatives, an important aspect of understanding the exposure, sensitivity, and capacity to respond of a population is to engage with that population directly (Glik et al., 2009). However, I chose not to directly engage Newport's visiting population. The reason was twofold. First, some literature suggested that the key populations to focus on in the development of a disaster management plan are the people who will be implementing the plan itself (Quarantelli, 1986; Drabek, 1995). Second, the visiting population to Newport is perpetually changing, which I believe highlights a much larger limitation for reducing the vulnerability of visiting populations in general.

The aforementioned federal, state, and county planning guidance mentioned in this paper suggests that first communities must understand their entire population, determine which groups are vulnerable and why, and then decide how to mitigate those vulnerabilities. This is reasonable guidance given the fact that the local population is present and can be actively engaged. However, a visiting population is perpetually changing, and the characteristics of one person or group may not be applicable to the next. I believe mass amounts of demographic data collected on a location's visiting population over time may yield generic trends such as number of visitors, their

age, gender, or language spoken that could be used for planning and preparation purposes. But, adequately representing individuality within the whole population would be difficult. For this reason, I chose not to focus my efforts on the visiting population, although I believe it to be a valid area for future research.

The second major limitation of my research was the inability to extensively interact with the hospitality industry. Several previous studies have identified the hospitality industry as a possible focus area for reducing the vulnerability in the visiting population, largely because they occupy the same space in the community (Drabek 1991/1995; Wood and Good 2004). Additionally, those interviewed in this study acknowledged that the hospitality industry was a worthwhile group to build resilience in with the hopes of subsequently reducing the vulnerability of the visiting population.

However, I was only able to secure interviews with three people from this industry. This result was consistent with the information provided to me by emergency managers and volunteers who continuously try to engage representatives from this industry as well. I believe that one reason for this was the result of my research primarily being conducted during the summer months when these businesses are occupied with large visiting population. Another, which was considered by those interviewed, was a combination of lack of time and a concern for the economic impacts of a possibly negative message to customers. This concern of negative economic impacts is articulated in other disaster risk reduction studies in tourism destinations, thus limiting results (Rittichainuwat, 2013).

I think this limitation of my research highlights the larger challenge of reducing the vulnerability of the visiting population on the Oregon coast. The visiting population occupies the same space and interacts with the hospitality industry in some fashion. If the hospitality industry is chosen to be operationalized in emergency management, then a relationship should be built.

Based upon my observations, the relationship is being cultivated, albeit slowly. However, a focus on how to best support this industry through visiting population preparedness is a worthwhile endeavor.

The third limitation is that the visiting population is only one of the vulnerable populations in Newport. There is an extensive seasonal workforce that faces both economic and social factors with respect to vulnerability (R. Martinez, personal communication, August 20, 2019). So, while the research and recommendations of this project may improve the resilience of the visiting population, the vulnerability of other populations within the community may still impact Newport's capacity to respond as a community and are worthy of future investigation.

The last and maybe greatest limitation was that my research focused on what the community can do right now as opposed to what the long-term goal is for adjustment and or adaptation. Burton et al. define adjustment as "designing a house to resist a storm surge" while adaptation is "locating and organizing a community over a long period of time so that its houses are beyond the reach of the storm surge" (1993, p. 49). The new OSU HMSC vertical evacuation structure is an example of an adjustment. Ultimately, the Oregon coast and its communities must decide how they are going to adjust or adapt to a CSZ hazard and how the visiting population will be accounted for in that decision? This is a complex decision as a working waterfront by definition occupies the hazard zone. The questions generally presented are what the characteristics of the hazard are, how can the community deal with them, and then what the best choice for the community is given the available options (Burton et al., 1993). Only the community can decide what is best for them, the challenge will be to integrate each community horizontally and vertically across multiple jurisdictions.

My recommendations for future research are intertwined with my recommendations for the community of Newport. For the location of the schools, they are out of the inundation zone,

but a more in-depth analysis would provide more insight on their location with regard to the local and visiting population centers in the community as well as the evacuation routes to each. If the school as a relief center is the right answer, then each school should be located in a manner to divide the burden of evacuees based upon spatial representation and likelihood of isolation within certain parts of the community. Second, a critical evaluation of the cost to retrofit the current schools or to build new schools would need to be done so a legitimate funding mechanism could be proposed to the community. As with any evacuation and shelter plan, there needs to be a way to get from the hazard zone to the shelter. Hardening of infrastructure has been identified as a priority, but a least-cost distance analysis would help the community see which routes should be prioritized. As demonstrated by rehearsals, this should not simply be a GIS endeavor, but will require ground truthing to determine the most efficient routes for evacuation. This analysis would be beneficial for both Newport, and to other communities to help mitigate isolation.

PROGRESSION TO SUSTAINABLE COMMUNITY PREPAREDNESS

Through my journey with this project I continuously reflected on why certain communities appear more prepared than others and what progression a community goes through from hazard identification to prepared. I also had the privilege of growing up in Oregon and have some first-hand knowledge on the discovery and subsequent preparation for a future CSZ earthquake. Using this experience, my review of relevant literature, and my communication with various personnel in my research I was able to formulate the following sequence of events following the discovery of the CSZ in the 1980s for Oregon's communities.

1. Following a deliberation of acceptance or denial, acknowledge the risk of the hazard.
2. Raise awareness and educate the population on the characteristics of the hazard and the options available to mitigate through adjusting or adapting.
3. Individual preparation begins for those that acknowledge the risk.
4. Individual preparation self organizes to family, neighborhood, social group, and eventually to the requisite jurisdictional level.
5. The self-organized informal effort transitions to a formal-organized preparedness effort with goals, leadership, and supporting legislation as necessary.

It is my estimation that Newport is operating in a transition between steps four and five. C. Moffet articulates that people become aware, get themselves prepared, and then begin preparing as a community and "this community effort is where Newport is right now, which is a good place to be" (personal communication, July 22, 2019). I feel it important to note that I do not believe these steps have to occur sequentially. All five steps could be occurring simultaneously in different areas of a jurisdiction, but I would hypothesis that a large portion of the population would need to move through steps one through four before an effective formal effort could occur.

L. Kozlowski proposed that in order for the preparation effort to be sustainable, then the self-organized undertaking would need to transition at some point to a formalized and professional movement with boundaries and frameworks to guide the operation. This formal transition enables a continuity of leadership and processes (personal communication, November 2019), thus enabling a sustainable effort. A recommendation for future research would be to substantiate or disprove these perceived phases of preparation, as well as the aforementioned hypothesis to reach a sustainable formal preparation effort. If the phases are accurate, then communities like Newport could benefit from research on how to most efficiently progress and transition through these stages into a prepared and sustainable community.

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