


RECOVERING FROM NATURAL DISASTER IN DEVELOPED COMMUNITIES: A
DISABILITY PERSPECTIVE

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Nov 20, 2017

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November 20, 2017

Date Approved:

A Research Paper submitted to the Graduate Program in Critical Disability Studies in
partial fulfilment of the requirements for the degree of

Master of Arts

Graduate Program in Critical Disability Studies

York University

Toronto, Ontario M3J 1P3

November 2017

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Abstract

The following research paper sets out to dissect the relationship between natural disaster mitigation and disability as it exists in developed countries. The main themes that were generated relate to issues of preparedness, the borrowing of mitigation strategies and the accessibility of infrastructure outside of disaster scenarios. Through a critical review of available secondary resources relative to the chosen disasters, it was discovered that disaster mitigation in developed countries puts individuals with disabilities at a disadvantage, despite verbal willingness to accommodate. This paper will highlight a series of other issues related to accessible disaster mitigation, including a motivation that diminishes with the passage of time and a dire need to include individuals with disabilities in the decision-making process. Future research may consider examining recommendations made following disasters of this year, and whether or not they become the reality in years to come.

Introduction

As climate change continues to increase the likelihood of natural disasters (Ichoku, 2017), and the aging Baby Boom generation continues to increase the number of people living with disabilities (Christensen et al., 2009), it becomes extremely important to consider the relationship between the two. This critical literature review uses a disability lens to answer research questions regarding natural disaster mitigation as it exists in different developed countries around the world. Through the exploration of natural disaster mitigation over space and time, themes that were developed include issues related to preparedness, the borrowing of mitigation strategies, as well as the accessibility of infrastructure, or lack there of. By closely analyzing the expert recommendations made available at the time of each disaster, and comparing them to policies that have since been implemented, this paper will reveal information about how each developed country is able to recover from disaster in a meaningful way. The aforementioned themes work together throughout this analysis to emphasize existing problem areas, as they relate to natural disaster mitigation and disability, throughout the different developed countries that are being explored.

Methodology

Overview

Three different natural disasters have been chosen and will be subject to the in-depth analyses that comprise this paper. The catastrophic events, that each lead to an emergency evacuation, include: Hurricane Katrina, the Tōhoku Tsunami and Black Saturday. These disasters were first selected because they each occur in different developed regions of the world. This was done to eliminate the problem of financial

barriers, and ensure that each country had relatively equal access to resources that might benefit their ability to plan for disaster. These disasters were also chosen because they vary across space and time, as illustrated below in Figure 1, which benefits the research by providing separate levels of analysis that generally do not interfere with one another.

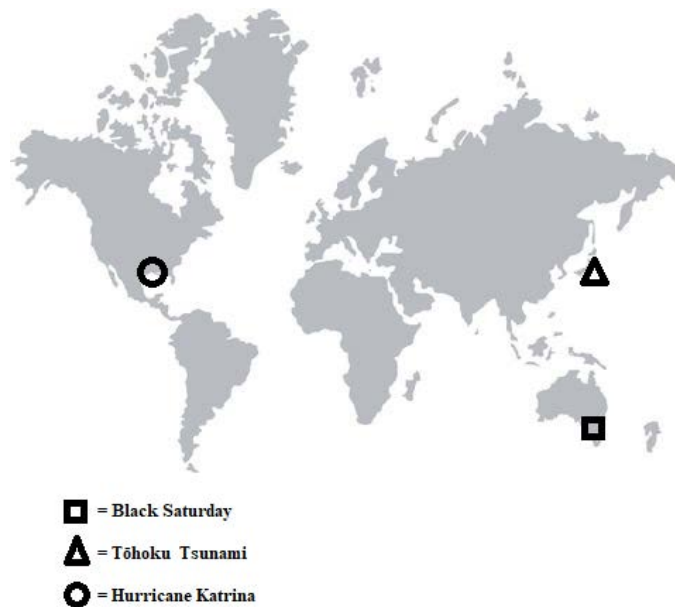


Figure 1: A map illustrating the different disaster areas being discussed.

This additionally allows for readers to get a sense of the differences, and more surprisingly, the similarities, that continue to arise between disaster mitigation efforts, despite the gaps in time and space. Table 1, below, draws comparisons between the disasters in order to better understand the variances that exist between them. The geographic and geological uniqueness of the hurricane in the United States, the earthquake/ tsunami in Japan and the bushfires in Australia, allow for each evacuation to be explored under varying circumstances. Secondary sources will be used to collect information immediately following each of the chosen disasters, which will later be

compared to changes that have been seen in the years that have passed. Three themes, which will be discussed in further detail later on, will help to draw connections between the selected areas of interest and reveal meaningful information about the relationship between natural disasters and disability.

Table 1.

Comparative values for Hurricane Katrina, Tōhoku Tsunami and Black Saturday

| Natural Disaster | Number of Buildings Destroyed | Number of People Displaced | Number of People Dead or Missing | Economic Loss |
|-------------------|-------------------------------|----------------------------|----------------------------------|--------------------|
| Hurricane Katrina | >1,000,000 | 600,000 | 1,836 | \$108 billion USD |
| Tōhoku Tsunami | 138,000 | >250,000 | 18,490 | \$360 billion USD |
| Black Saturday | >2000 | 7,562 | 173 | \$3.46 billion USD |

N.B.: Information collected from (Austalian Government, 2017), (CNN Library, 2016), (Fackler, 2015), (Ferris & Solis, 2013), (Foley, 2009), (Gray, 2010), (Pyler, 2016), and (Timmons, 2016).

Critical Disability Framework

In the field of disability studies, it is always beneficial to use a critical lens while approaching research, so that problem areas are more easily identified and improved upon. Throughout the entirety of this paper, a critical disability framework will be used in an attempt to do exactly that. Through this disability framework, the wellbeing of individuals with disabilities will remain the first priority of research and their needs will be continuously revisited throughout. The critical aspect of this framework will make it so that the data is not simply collected, but rather, so that it is gathered and interpreted in a meaningful way that will benefit the disabled community long term. It is important to recognize that the criticisms offered are not inherently negative, and that they are made with the goal of improving upon existing ideas or practices in the areas being explored.

Data Collection

A critical literature review was conducted as a means of data collection throughout this research paper. Secondary resources that were referenced include: newspaper, magazine and other media sources that were published both at the time of the disaster and in the years following, government documentation revealing policy changes in the relevant areas, UN forum posts, journal articles from disability experts, as well as articles from experts in the disaster areas that are discussed. This approach worked well with this paper, as it allowed the researcher to gather quantitative and qualitative data relating to each disaster and the affect that each had on their surrounding communities. Exclusion criteria included blog posts from websites that were not credible, as well as opinion pieces from individuals who were not proven to be experts in the relative fields of discussion. The first set of data collected was quantitative in nature, providing statistics about the magnitude of each disaster, the percentage of the population living with disabilities at the time, the number of fatalities and other information that assisted the researcher in drawing meaningful conclusions. The second set of data was qualitative, and consisted of expertly recommended solutions to problems that were encountered during evacuations, as well as information on how far along each developed country as come since the occurrence of each disaster. When combined for further analysis, the data that was collected assisted the researcher in identifying the three themes and answering the research questions that this paper had originally set out to address.

Data Analysis

The data that was collected, while both quantitative and qualitative in nature, was analyzed using an interpretive and qualitative method. After exploring numerical data

relating to each disaster, the researcher was able to understand the scope of the events and begin exploring the expert recommendations that followed. Since catastrophic disasters, such as the ones being examined, affect the lives of so many people, they are often given the attention of experts from a variety of backgrounds hoping to improve the future of disaster mitigation in the affected areas. The recommendations and advice of key stakeholders were carefully analyzed, followed by an examination of more recent articles and government documentation that reveal information on whether or not these recommendations have become the reality. Each specific disaster has been given its own section, followed by subheadings that help to break down the chosen areas of exploration. Through this process, and later through the comparison of the different developed countries being examined, three major themes were identified: preparedness, borrowing of strategies, and accessibility of infrastructure. These themes, which will be incorporated in the discussion throughout, bring together information in a meaningful way, which will hopefully lead to the improvement of future disaster mitigation efforts as they relate to individuals with disabilities.

Limitations

The information relevant to the Tōhoku tsunami was primarily available through Japanese formats, creating a language barrier and limiting the amount of information that the researcher was able to access. Relative costs of the disaster were also given in Japanese currency, but have been converted to CAD for the purposes of this paper.

Major Themes

Preparedness

The first theme, which all three countries have repeatedly exemplified, revolves around the idea of preparedness. Despite having a seemingly high level of preparedness, developed countries that are most susceptible to natural disasters are not fully equipped to offer protection to all citizens, putting individuals with disabilities at a greater disadvantage. While these countries may seem prepared on paper, the natural disasters being examined put these areas to the ultimate test, exposing their weaknesses and emphasizing the need to further incorporate individuals with disabilities.

Borrowing of Strategies

The second theme relates to the similarities that can be seen across the different areas being explored, and the patterns that were identified in the ways that these areas have developed their disaster management techniques. Developed countries have a tendency to borrow mitigation strategies from one another, whether or not experts agree, and whether or not the strategies have proven to be successful in the past. This theme is complex because it is difficult to determine whether countries are mimicking one another, or whether these ideas have occurred to each location organically as a means of survival. With the accessibility of global information, it would be far-fetched to assume that key stakeholders responsible for developing mitigation techniques were ignorant to the efforts of other countries. For these reasons, this theme revolves around the idea that developed countries borrow mitigation strategies from one another, whether or not it is recommended.

Accessibility of Infrastructure

The third theme that will be seen throughout this paper relates to accessibility as it exists outside of a crisis situation, and the effect that this has on each country's ability to cope with disaster. The accessibility of infrastructure in times of peace, is positively correlated with each country's ability to accommodate individuals with disabilities during and after an emergency evacuation. A country that is ill-equipped to handle disability at the best of times faces much more difficulty when a natural disaster strikes. This theme relates to all aspects of infrastructure, and refers to both the evacuation process as well as recovery.

Hurricane Katrina**Background**

On August 29, 2005, Hurricane Katrina touched down on the Gulf Coast of the United States, quickly becoming the "most catastrophic natural disaster in US history" (CNN Library, 2016). Despite the levees put in place to deter severe flooding, as well as practiced evacuation planning, the Category 3 hurricane managed to cause \$108 billion in damages and take the lives of 1,836 people (CNN Library, 2016). It is imperative that citizens living along the Gulf Coast be prepared for severe flooding and hurricanes of this caliber, as the geographic and geological factors make this area particularly susceptible to these types of extreme weather patterns. According to Michael Brennan, a senior hurricane specialist at the National Oceanic and Atmospheric Administration, the shallow waters and gently sloping continental shelf of the Gulf Coast create opportunity for severe storm surge. Many of the surrounding cities additionally lay flat and have areas

located below sea level (Rowan, 2010), allowing the surges to move further inland which often can result in more damages.

While disasters of this magnitude affect the lives of so many, the lives of individuals living with disabilities are disproportionately affected. In line with the first theme of preparedness, a study examining the experiences of disabled people during Hurricane Katrina found that the evacuation process was hindered by a lack of resources available to meet their needs. Many people with visual and hearing disabilities were, “unable to obtain necessary information pertinent to their safety because said communication did not comply with federal law” (Frieden, 2006, pp. 2), meaning that many individuals were unaware of how imminent the threat really was. Additionally, individuals with physical disabilities, “were often unable to evacuate because transportation was inaccessible... most busses did not have wheelchair lifts” (Frieden, 2006, pp. 2). This means that for the individuals able to obtain information on the seriousness of the threat, evacuation was still not an option and they were often left for dead. These issues, and more, will be discussed later on in further detail, along with a discussion of which changes have been successfully implemented.

It is all too common for the needs of disabled people to be overlooked because they are perceived as a minority group among the majority of able-bodied people. However, almost immediately following Hurricane Katrina, the National Council on Disability (NCD) estimated that, “there were roughly 155,000 people with disabilities over the age of 5—or about 25 percent of the cities’ populations—living in the three cities hardest hit by the hurricane: Biloxi, Mississippi; Mobile, Alabama; and New

Orleans, Louisiana” (Frieden, 2006, pp. 3). This statistic illustrates the high percentage of the population that is disproportionately affected by disaster in this area, due to an inability to meet their needs in a time of crisis. Since these statistics were gathered immediately following Hurricane Katrina, it is both an accurate and alarming fact that needs to be addressed with more specificity and attention than it has received in the past.

It didn't take long after Hurricane Katrina devastated the Gulf Coast, for experts from all backgrounds to begin analyzing what had happened. Key political figures, hurricane experts as well as experts of disaster management and disability rushed to the scene to identify problem areas and begin planning mitigation strategies for the future. The following sections will break down the areas that these experts identified immediately following Hurricane Katrina, and explore what changes were actually made in the twelve years that have passed.

Communication

Expert recommendations

The first recommendation made shortly after the devastation of Hurricane Katrina, is that communication of the disaster needs to be improved so that information may reach all populations. During the examination of what went wrong during Hurricane Katrina, one of the main issues was effectively communicating the seriousness of the disaster to individuals living with disabilities. With reference to the first theme, individuals with disabilities were left at a disadvantage due to an exaggerated sense of preparedness. Effective communication, “was troublesome for people with visual impairments because television broadcasts typically did not provide audio descriptions of visual displays of critical information, such as maps or lists of affected areas” (Frieden,

2006, pp. 3). As a result of this finding, one of the earliest recommendations made following the disaster was to improve communication, so that individuals of all abilities can be made aware of the disaster or how to protect themselves.

Within one year of Hurricane Katrina, the Department of Commerce and the National Center for Accessible Media (NCAM) teamed up, “to develop and encourage adoption of standardized methods, systems and services to identify, filter and present content in ways that are meaningful to people with disabilities leading up to, during and after emergencies” (Frieden, 2006, pp. 6). Though this did not happen right away, NCAM immediately began taking suggestions from individuals with disabilities as well as communication experts on how to create a standardized and effective alert system (Frieden, 2006, pp. 6). While considering the third theme of accessible infrastructure, it is important to ask the question of whether or not this failure during disaster mitigation is a reflection of the accessibility of the infrastructure as a whole. It is only after several hundred deaths that accessible communication is being emphasized as a serious problem, meanwhile many individuals with disabilities have been living with these problems for years.

Researchers discussing communication in 2007, two years after Hurricane Katrina, identified new media as a something that, “has not emerged as a strong source of information dissemination in a crisis event” (Spence, Lachlan, Burke, & Seegar, 2007, pp. 402). The results of this same study identify the use of television and new media as a call for future research, which begs the questions of whether or not it has been adequately addressed in the years that have followed.

Changes that have been seen

Communicative improvements began happening soon after 2005 when Hurricane Katrina touched down, and continue to be seen today. Immediately following the disaster, the president, “ordered the FCC, DHS and the Commerce Department to overhaul the national Emergency Alert System (EAS), noting that the system relies on outdated technology and that broadcasters’ participation in local alerts is completely voluntary” (Frieden, 2006, pp. 7). Since then, the weather channel has significantly increased the amount of captioned programming and has begun to caption the emergency broadcasts that are sent to areas seriously affected by dangerous weather conditions (Frieden, 2006, pp. 6).

Additionally, as of 2017, the Federal Emergency Management Agency (FEMA) has begun equipping each Disaster Recovery Center, “with communication devices that allow people who are blind... and people who are deaf... or have other communication access needs to receive disaster information first hand” (Federal Emergency Management Agency, 2017). As this paper progresses, the relevance of the second theme becomes more and more clear. The use of technology when it comes to notifying individuals of emergency evacuations is one that many countries have utilised, and that is consistently recommended by experts. The availability of advanced technology that people have access to in 2017 can and should make communicating emergency information more efficient in years to come.

In recent years, The Federal Communications Commission (FCC) has also gotten on board and now requires that broadcasters, “make local emergency information accessible to persons who are deaf or hard of hearing, and to persons who are blind or have visual

disabilities” (Federal Communications Commission, 2017). This, along with the FCC’s efforts in improving the Emergency Alert System (EAS) that exists in the U.S., gives hope for people with disabilities living in the area and improves their chances of survival if a disaster of this caliber were to touch down once again.

Areas of needed improvement

Despite the FCC’s previously mentioned efforts to make EAS accessible, the system needs some work. Though the descriptive documentation states that FCC ‘requires’ EAS to offer audio and visual accessibility, a paragraph near the end reveals that this portion is not yet enforced. The document states that while, “determining whether particular details need to be presented visually and aurally, programmers may rely on their own good faith judgments” (Federal Communications Commission, 2017). This shows that though programmers are encouraged to make the emergency information accessible, in the end it is their choice. By choosing whether or not the emergency alert should be accessible, programmers are essentially being given the choice of who should live and who should die, as disabled people are left in the dark during life threatening situations. This point also fits well into the third theme, which emphasises the need to re-examine current definitions of preparedness.

An additional problem with the EAS, is that it generally does little to address accessibility issues. The area on FEMA’s website dedicated to disability emphasizes only how they intend to deal with the aftermath of a disaster, and does not mention accessibility issues with regard to the EAS itself (Centres for Disease Control and Prevention, 2015). Though there have been steps in the right direction since Hurricane

Katrina with regard to communication, there are definite areas of improvement that have yet to be addressed.

Evacuation Planning

Expert recommendations

The first recommendation, with regard to evacuation planning, is that individuals with disabilities should have a premeditated and practiced emergency plan in place. An examination of the aftermath of Hurricane Katrina, “concludes that disabled people are more likely to have emergency supplies but less likely to have an evacuation plan” (Spence, Lachlan, Burke, & Seegar, 2007). While considering reasons why this may be the case, the same study suggests that:

“Some disabled people may see little prospect of evacuation or simply may not know how to make arrangements for it; they may, therefore, see the possession of an emergency supply kit and supplies as their best chance of surviving the crisis” (Spence, Lachlan, Burke, & Seegar, 2007, pp. 401).

Based on this finding, an obvious improvement for the future would be ensuring that disabled people recognize the importance of having an evacuation plan in place, rather than just being prepared with an abundance of supplies. This point is particularly important while considering the theme of preparedness, as it brings to light the apparent flaws in existing mitigation strategies, once again leaving individuals with disabilities at a disadvantage.

Further and more specific discussions of this recommendation involve the need for motivation and close relationships, as the high number of disabled individuals living in these areas make evacuation plans extremely difficult to enforce. Having people individually motivated to be proactive in their disaster planning would help to increase

the number of people with an evacuation plan. A specific recommendation that was made regarding motivation in 2007 involves, “expanded registration efforts to allow emergency officials to know where disabled people live and to coordinate the arrival of help before a storm arrives” (Spence, Lachlan, Burke, & Seegar, 2007, pp. 402). If disabled individuals were motivated to register themselves, it would alleviate the pressures of emergency response teams to locate and identify the needs of every person. Additionally, close relationships would ensure that each disabled person had someone who could help them along the way if their needs were not being met. With reference to the theme of borrowing strategies, it will become evident later on that each country being explored also emphasizes the importance of humanitarian good will and the reliance on relationships during the evacuation process.

Changes that have been seen

One of the biggest recommendations to become a reality in the past few years involves the development of the Special Needs Registry in New Orleans. The registry holds a database of information for over 4,000 people, and is, “created to provide transportation and shelter for New Orleanians with special medical needs during emergencies such as a power outage, evacuation or hurricane” (Evans, 2017). Beginning shortly after Hurricane Katrina, the registry has slowly but surely continued to grow, reaching 700 people by 2012. This point works well with the second theme of borrowing strategies, as the other countries and experts in other areas see the importance of tracking individuals with disabilities, so that emergency personnel can locate them in a time of crisis. Along with the registry comes a small outreach team available to update the

records annually, which will hopefully help to keep the system working effectively in the years to come.

While reflecting on whether or not disabled people have become more aware of the need for an evacuation strategy, it is difficult to determine. While many of the recommendations involve practicing evacuation strategies both at home and in the workplace (Kailes & Enders, 2007, pp. 234), it is almost impossible to know whether or not this has become the reality. Even if responsible governing parties were able to enforce workplace evacuation planning, it is much more difficult to do so in a person's home. The difficulties in finding this information further emphasize the theme of preparedness, by illustrating that even government policies can be easily overlooked if the individual is not personally motivated.

Areas of needed improvement

While the development of the Special Needs Registry is a huge step forward, the system is far from perfect. The first and most obvious problem is that it is created solely for New Orleans. Though New Orleans saw the most damaging effects of Hurricane Katrina, it is not the only area that was affected or that is at risk for the future. It is important for every city lining the Gulf Coast to be equipped with a Special Needs Registry, so that emergency services can be aware of where the most vulnerable populations are living and what they need to ensure their safety.

One major flaw with the Special Needs Registry is that it is taking so long to catch on. As of this year, only “56 people in the registry are known to need an ambulance in order to evacuate” (Evans, 2017). Based on the percentage of disabled people living in

New Orleans, it can be assumed that there are many others who would need an ambulance to evacuate that have yet to register themselves on the system. Another area of concern regarding the Special Needs Registry is that it has never been used during a hurricane, as there has yet to be a need for it. Despite this however, there are plans in place to create a mock evacuation, which should give a broad idea of how well the system works.

While determining what to do during a hazardous situation, there are two types of efficacy to be considered. The first type of efficacy is response efficacy, which is, “to what extent the recommended response is effective and feasible in averting the threat”, and the second is self-efficacy, “how confident they feel about their ability to perform the recommendations to avert the threat” (Raskovic, Mrdja, & Svetomir, 2013, pp. 330). Even when communication is perfected and individuals feel they have the response efficacy to recognize the dangers of a disaster, they may not feel they have the self-efficacy to act on it; the result being that individuals are equipped with supplies but lacking an evacuation plan. The registry, if improved, could assist in providing individuals with both response and self-efficacy.

Transportation

Expert recommendations

Another important recommendation made following Katrina, is the need for accessible transportation. During the hurricane, as mentioned earlier on, disabled individuals, “were often unable to evacuate because transportation was inaccessible” (Frieden, 2006, pp. 2). While it is important for public transportation to be able to allow

people with physical limitations on and off of transporting vehicles, try to consider accessibility in a broader sense. It is important for transit to not only be accessible in the physical sense, but to be accessible in a way that every person is able to understand when and where they are able to access these vehicles. This may involve providing schedules for the hearing impaired as well as using braille at the different pick-up locations. This may also involve the creation of a simple all-in-one websites that uncomplicates transit routes and can be used in emergency situations. The inaccessibility of transportation during Hurricane Katrina created an obvious barrier to the survival of people with disabilities as evacuation was critical during that time. This point is important to consider while looking at the third theme of accessible infrastructure, as it makes clear the positive correlation between inaccessible infrastructure and the number of deaths related to disability during disaster. If these areas were already equipped with accessible transit, individuals with disabilities would not have faced such difficulties when their lives were depending on it.

Changes that have been seen

The most recent document regarding accessible emergency management released by the Federal Emergency Management Agency (FEMA), prioritizes transportation by making it first on their agenda. On a list of many preparations for the coming year, the number one item stated, “preplanning for evacuations to include accessible transportation for people using wheelchairs and other mobility devices” (Federal Emergency Management Agency, 2017). The use of the word ‘preplanning’ here illustrates the importance of having accessibility measures premediated. Additionally, having FEMA

prioritize accessible transportation on a list of many goals for 2017 shows that it is of great importance, which will hopefully result in fully accessible transportation across the Gulf Coast cities as well as the entire country.

Areas of needed improvement

Though FEMA prioritizes transportation on their list of goals, they fail to mention exactly how they will ensure that accessible transit is available for all during these high-pressure evacuations. Detailing how they plan to access every person and be able to accommodate their needs would be beneficial and make their tentative goals much more likely to occur. It is also important to make transportation accessible outside of conditions that demand evacuation. As practice makes perfect, practicing for emergency situations is the best way to properly prepare. If all transportation were to be accessible at all times, people would be accustomed to the procedure and be much more likely to experience a successful evacuation when it became time to do so.

Physical Measures

Expert recommendations

The physical protection of the Gulf Coast is another improvement for the future that was immediately addressed by experts following Hurricane Katrina. While this area of needed improvement is not specifically focused on individuals with disabilities, it affects them as well as every other person living in these at-risk areas. One of the main reasons this particular hurricane was so devastating, was that the levees built to deter flooding could not withstand the amount of water that the hurricane brought.



Figure 2: The 17th Street Canal levee breached by Hurricane Katrina (Eggler, 2011).

As a result, the water rose overtop of the levee system causing severe flooding throughout the cities. Immediately following Hurricane Katrina, as a quick fix, “temporary pumps and reinforced walls were built at New Orleans' three outfall canals ... as part of the overhaul of the metro area's levee system” (Swenson, 2014). This temporary system was immediately recognized as critically important, as the overflow of the levees was one of the most obvious failures during the devastating hurricane. The second theme of borrowing strategies is critically important in this sense, as most areas situated near adjoining tectonic plates are prepared with physical measures such as these. Though in this case they were expertly recommended, these levees have continuously proven to be unsuccessful in naturally occurring disasters around the world. The plan was to have the system completed by January of 2017 but unfortunately there have been many setbacks along the way.

Changes that have been seen

Seeing as the physical protection of the Gulf Coast was such an obvious failure during Hurricane Katrina, the expertly recommended improvements saw immediate action. Beginning with the aforementioned temporary structures, experts began planning the construction of the new canals and they were said to be completed by January of 2017 (Swenson, 2014). Because the levee failures of Hurricane Katrina were so easily identified, it did not take long for people to begin working to fix this problem. If all of the issues discussed throughout this paper were as visible to the naked eye, it is likely that much more action would be seen for each.

Areas of needed improvement

While these canals were said to be completed by January 2017 (Swenson, 2014), the discovery of toxic soil within them has delayed the completion as it must be removed (Schleifstein, 2017). This has drastically slowed down the process, as twelve years have now passed and the new canal system is still not complete. It will be interesting to see whether or not they will be completed in the years to come, and if they are truly ready to withstand the high waters that future hurricanes are sure to bring.

Tōhoku Tsunami**Background**

On March 11, 2011, the most powerful earthquake ever recorded in Japan occurred just off the coast of Tōhoku, with a record breaking magnitude of 9.1 (Mw) (McCurry, 2011). While the first earthquake itself took place far into the Pacific Ocean, the aftershocks and tsunami waves that came as a result took the lives of over 15,000, leaving little behind but rubble in it's path (Zaré & Ghaychi Afrouz, 2012, pp. 12). As a

country geographically situated near two tectonic plates, the Pacific and the North American, Japan is widely recognized as one of the most earthquake-prone countries in the world (Lee, 2013). What made the Tōhoku earthquake particularly powerful was the layer of clay that acted as a lubricant on the tectonic plates, resulting in severe horizontal displacement causing the massive tsunami that swept over the shores of Japan and took the lives of thousands (Lee, 2013).

As a result of being earthquake-prone, as well as being one of the most technologically advanced countries in the world, Japan often boasts about being a “pioneer in crisis management”, and having “the most advanced earthquake and tsunami warning system in the whole world” (Zaré & Ghaychi Afrouz, 2012, pp. 14). While this may be the case, it became clear during this 2011 Tōhoku tsunami that their mitigation planning is far from perfect. At the time of crisis, the acting Japanese Prime Minister, Naoto Kan, vowed to, “make an all-out effort to ensure the safety of all the people” (McCurry, 2011). Despite the well-meaning intention of this statement, it’s vagueness situates it fittingly into the first theme of preparedness, as individuals with disabilities were once again given a disadvantage due to an inability to meet their needs.

With an estimated 340 person per kilometer ratio and an overall population of 127 million, Japan is one of the most densely populated areas of the world (Zaré & Ghaychi Afrouz, 2012, pp. 12). Dense populations, such as that of Japan, can often result in more increased difficulty for individuals with disabilities, due to the loud noises and lack of space that often accompany heavy crowding. During a natural disaster, obstacles such as these can become magnified as panic sets in and people begin to fight for their lives. In

addition to being densely populated, the proportion of people aged 65 years and over in Japan's population is the highest in the world, with a projection that by 2030, "one in five people will be 75+ years" (Muramatsu & Akiyama, 2011, pp. 426). Given that aging is one of the leading causes of disability, and that densely populated areas are not the ideal living conditions for this, it becomes evident that Japan is in dire need of an evacuation plan that incorporates disability to the fullest extent.

Communication

Expert recommendations

Much like other countries being explored throughout this paper, and fitting well into the second theme of borrowing strategies, Japan's emergency procedure for natural disaster begins with a warning system for notifying residents that they are at risk. As mentioned earlier, the Japanese people pride themselves on having one of the most advanced warning systems in the world, and yet they were still not able to effectively provide safety for every person. Shortly after the tsunami, when experts began analyzing the major problems areas, one of the main problems that was addressed was that, "seismologists and geophysicists hadn't anticipated such a large earthquake happening off Japan" (Synolakis, 2011). Because they were not anticipating an earthquake of that magnitude, they were not as quick to notify residents of the need for an immediate evacuation.

Despite being the best in the world, the warning systems are not able to communicate the information until 10-12 minutes after the earthquake's occurrence, limiting the warning time for the citizens of Japan (Synolakis, 2011). In most cases, for individuals living on flat land, safety means having to travel, "three miles [about five

kilometers], and if you have about half-an-hour to run, three miles in a half an hour, that's a good jog” (Synolakis, 2011). Running that distance in such a short period of time would be challenging for most able-bodied people, let alone individuals living with any kind of disability. For these reasons, it becomes clear that every minute counts and that communicating the emergency as quickly as possible is essential for the survival of many.

Another communication failure immediately addressed by experts following the killer tsunami of 2011, is that the early warning systems, “were not designed to meet the needs of people with physical disabilities; people with hearing issues could not hear the alarms” (OCHA, 2014). For a country that claims to be superior in both emergency management as well as technology, incorporating accessibility should have been an easy feat.

A final criticism that can be made with regard to communication, is that during the evacuation of this tsunami, “one of the most facultative factors for emergency managers was proper behaviour of people who follow commands cautiously” (Zaré & Ghaychi Afrouz, 2012, pp. 14). In other words, Japan is alluding the success of the evacuation to the able-bodied and able-minded citizens that were able to hear the warning systems, process the severity of the situation and physically bring themselves to safety. While having able-bodied people hear the warnings and respond accordingly is undoubtedly an important part of the process, it should not determine the success of an evacuation. For this evacuation to have gone successfully, all individuals, able or non,

should have had the warning communicated to them in an effective manner so that even the most vulnerable populations were made aware of the emergency.

Changes that have been seen

Since the occurrence of the 2011 tsunami in Japan, efforts have been made to improve the countries warning systems. As one of the major problem areas identified by experts was the underestimation of the tsunami's size, there are new procedures in place to deter this in the future. Rather than estimating the exact size of the earthquake and warning citizens based on these predictions, Japan's Meteorological Agency, "has enacted new analysis procedures based on an earthquake's maximum possible magnitude and instituted an updated warning system" (Becker, 2016). As Japan is an earthquake-prone country, they have had the opportunity to test this new method in real scenarios and it has proven to be successful so far.

Even with the most efficient communication, however, some individuals may not be able to flee in time. In an attempt to solve this problem, Daiwa House, Japan's largest homebuilder, began marketing, "Tsunami Evacuation Towers" in 2015, for individual families to purchase alongside their homes. Having an accessible structure within close proximity would make up for communicative errors and allow for individuals who are unable to evacuate as quickly to seek refuge somewhere close by ("Tsunami Evacuation 'Towers' to be Marketed in Japan," 2015).

Areas of needed improvement

While having individual vertical tsunami structures is a good idea in theory, it is a luxury that many residents would not be able to afford. The aforementioned structures are

being sold for nearly 6 million yen, which would be nearly \$70,000 CAD with today's exchange rate ("Tsunami Evacuation 'Towers' to be Marketed in Japan," 2015). These structures become further inaccessible while considering the fact that individuals with disabilities are often unable to work, making the idea of purchasing one for a single family seemingly impossible.

Aside from the vertical structures that are on the market to be purchased individually, there has not been a lot of progress when it comes to building these for the general public. While they are an expert idea that would solve for the problem of delayed communication and warning systems, the only thing that seems to be happening six years after the Tōhoku tsunami are hypothetical structural plans for the future (Voulgaris & Aleksejeva, 2017). Despite a lack of action, it should be acknowledged that using mathematics to plan for effective evacuation structures is extremely important, as already they are able to identify problems with Japan's dense population and the number of people that these structures would be able to support. However, an additional problem is encountered while considering the limit put on the number of people able to utilise these hypothetical structures. Given that safety would be offered to the first citizens to reach the publicly accessible towers, it is unlikely that individuals with disabilities would win this race to survival, leaving them once again at a disadvantage.

In terms of making warning systems more accessible to individuals with disabilities, there is very little to suggest that the nation is even working toward some sort of solution. As reported by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) in 2014, individuals with hearing impairments were

among the highest fatalities following Japan's 2011 Tsunami. While this statistic raises obvious red flags, there is almost no information insinuating that Japan is working to deter this problem. Rather, the media outlets continue to praise Japan for being one of the most advanced in the world when it comes to tsunami and earthquake warning systems. The lack of attention given to individuals with disabilities, during disaster mitigation, mimics the attention given to the development of an accessible society in general, making this point fit seamlessly into the third theme of accessible infrastructure.

Evacuation Planning

Expert recommendations

Before discussing the problems with Japan's evacuation planning as it existed during the time of the Tōhoku tsunami crisis, it is important to consider the third theme of accessible infrastructure, and comment on the supports for disability that existed there in times of peace. When asked why the mortality rate of people with disabilities was so high during this disaster, experts from the Japan Disability Forum pointed out that, "most of the disaster stricken areas had scarce social resources for disabled persons... this fact seems to correlate with the extent of the damage" (Fujii, 2012). In other words, at the best of times individuals with disabilities were at a disadvantage, so it would be unrealistic to assume they were prioritized in a time of panic and disaster. This apparent relationship, between how disability is addressed in times of peace and how it is handled during disaster, directly relates to the third theme of accessible infrastructure.

Another major criticism that was immediately addressed by the Japan Disability Forum, involves the strict policies that were in effect at the time of disaster, under the

Private Information Protection Law (Fujii, 2012). While this law makes it so that individuals can feel comfortable knowing their information is not being broadcasted, it also played a role in limiting the information accessed by emergency respondents. As a result of this, individuals in need of emergency assistance during the Tōhoku tsunami were not able to be identified or located.

When the tsunami had ended, the struggles for Japan's most vulnerable population did not. The harsh impact of the disaster on disabled and elderly people, "is not only seen in the death rate, but also in the various stages of their lives after the disaster" (OCHA, 2014). There have been several stories that have surfaced regarding inaccessible washrooms in the shelters that were provided, as well as crowded and tense environments that were too stressful for these individuals and their families and/or caregivers. These harsh conditions, again, bring us back to the third theme of accessible infrastructure, and how it affects the post-disaster experience. As a result of inaccessible housing, "community health workers found many people with mental and intellectual disabilities living on the upper floors of their damaged houses, or even crammed into small spaces, such as cars" (OCHA, 2014). These unideal circumstances provide evidence for the fact that it is important to consider all aspects of evacuation planning; both at the time of crisis and after the disaster has passed.

Changes that have been seen

As of June 2017, the Privacy Information Protection Law, that was criticized by disability experts, was amended ("Amended privacy protection law," 2017). While this

took six years to complete, the hope is that the removal of this barrier will allow for emergency respondents to reach vulnerable individuals more easily in future crises.

In the years following the Tōhoku tsunami, Japan experienced backlash from the media as well as disability advocacy groups that were not pleased with the way the evacuation was handled, before and after the time of crisis. As a country that prides itself on being leaders in disaster management, Japan was quick to deter some of these problems. Within a few years of the disaster, “agreements [were] made with local welfare facilities to use them as specialized evacuation centres, and tailor-made evacuation and assistance plans for people with disabilities [were] developed” (OCHA, 2014). This statement from OCHA addresses both evacuation planning during and after the occurrence of a natural disaster. This statement is critically important while considered the theme of accessible infrastructure, and how it can drastically improve the experience of natural disasters for individuals with disabilities.

Three years after the destructive tsunami of 2011, Japan’s government began to introduce public housing solutions for the people who lost their homes to the disaster. In an effort to provide these affordable housing options to the individuals who need it most, people with disabilities were prioritized for these (OCHA, 2014). This, once again, relates directly with the third theme of accessible infrastructure. Through the prioritization of individuals with disabilities, Japan is proving that they recognize the importance of infrastructure as it relates to successful evacuation.

A final change that occurred at the most basic level, was the amendment of the Disaster Response Basic Law. This law is Japan's guide for disaster management, and was amended in 2013 to better prepare for large scale disaster. The amendment of this law, "obligated municipal governments to prepare lists of people who may need special assistance, such as the elderly and disabled, and provide those lists to firefighters and other officials" (Umeda, 2013). Using technology and disaster management planning to make this kind of database obligatory for all citizens is the kind of change that makes Japan a world leader in both of these areas. It is hoped that this amendment will dramatically increase the survival rate of individuals with disabilities in upcoming disasters.

Areas of needed improvement

When it comes to social supports for individuals with disabilities outside of a disaster setting, Japan has not seen many improvements. The criticism that came after the Tōhoku earthquake and tsunami generated change in disaster planning, as well as supports for after its occurrence, but no major changes to social supports have been seen outside of that. One of the criticisms that was brought up by experts following the crisis, was that their support system for people with disabilities, even in times of peace, was subpar (Fujii, 2012). Much like the third theme of accessible infrastructure, experts believe that high death rates of individuals with disability during this tsunami were directly correlated with the lack of social supports that existed outside of emergency planning (Fujii, 2012). While Japan has created social supports to assist with individuals

that were hit hardest by the 2011 tsunami, there is no evidence to support the fact that social supports have increased outside of a disaster scenario.

Transportation

Expert recommendations

The issue of transportation becomes particularly challenging while dealing with a tsunami, as a result of the flooding that occurs during this type of disaster. During the Tōhoku tsunami, all roads were restricted to emergency vehicles only, except for the subways and trains that remained open to the public. Navigating subways and trains, at the best of times, can be challenging for anyone. While considering additional crowding during an emergency evacuation as well as confusion that complicated transit systems may cause someone with an intellectual disability, it is safe to say that individuals with disabilities were put at a disadvantage. In many cases, however, particularly for electric wheelchair users, this was the only option (OCHA, 2014).



Figure 3: The inoperable roadways of Japan during the 2011 tsunami (Taylor, 2016).

This problem relates to the theme of preparedness as well as the theme of accessible infrastructure. It relates to preparedness while taking into account the disadvantage that individuals with disabilities are put at as a result of improper planning. Leaving the roads open to emergency vehicles likely seemed like a good plan on paper, but in reality, there are not enough emergency personnel to meet the need. The second theme of accessible infrastructure is relevant because if subway systems and transit were made entirely accessible on an everyday basis, it would not be considered as much of a challenge during evacuation.

When it came time to evacuate, the transportation options were so limited that many people were carrying wheelchair-bound loved ones up the stairs to higher ground where they thought they might seek refuge. As the waves continued to destroy building after building, people were left without options to escape it and were often left for dead. The world's media was amazed by the humanitarian behaviour of the Japanese people as they came together to help one another, however, "the management of government and authorities showed some deficiencies" (Zaré & Ghaychi Afrouz, 2012, pp. 12). For individuals that needed assistance with the evacuation process, "there was no system in place to ensure that all those who needed help to flee their homes would receive it" (OCHA, 2014). As a result of improper transportation planning, "people with physical, mental or intellectual disabilities were twice as likely to be killed or injured in the disaster" (OCHA, 2014). The disproportionate disadvantage that individuals with disabilities were left at during the 2011 tsunami is both unjust and entirely avoidable.

Changes that have been seen

The aforementioned amendments to the Disaster Response Basic Law in 2013, as well as the Privacy Information Protection Law in 2017, should also be beneficial in solving issues of transportation, as it will make it easier for emergency respondents to identify and locate individuals in need of assistance during an emergency evacuation. The revised Disaster Response Basic Law discusses keeping track of individuals with disabilities through a computer system, which fits the borrowed strategy theme by being seen in other developed countries. Additionally, the head of OCHA'S Japan office, Masaki Watabe, states that, "[Japan] has revised its disaster management plan to ensure that the different and specific needs of people with disabilities are better addressed" (OCHA, 2014). Watabe alludes to the experiences of wheelchair-bound individuals being carried to safety during the Tōhoku tsunami, and ensures that transportation options and evacuation assistance will be available during future disaster (OCHA, 2014).

Areas of needed improvement

While promises of future improvement are important, it is nearly impossible to practice this type of large scale emergency evacuation. When it comes time, how can people be sure that the number of individuals with disabilities will match the number of emergency response vehicles ready to help with evacuation? Though the revised Disaster Response Basic Law discusses keeping track of the number of individuals with disabilities, how can they be sure that every person needing assistance has gone through the process of self-registry? Online systems are often made through high-tech and inaccessible formats that might be challenging for some individuals to navigate. It would be beneficial to make this kind of registry mandatory and available through varying

accessible platforms, and to ensure that the number of responding vehicles is enough to evacuate the vulnerable population that is seeking assistance.

Physical Measures

Expert recommendations

Immediately following Japan's 2011 tsunami disaster, many experts were quick to comment on one of the most obvious failures, which was the collapse of the seawalls. The concrete walls, in many parts of Japan, were 33 feet tall. In the area which the tsunami occurred, they were only about ten feet (Synolakis, 2011). This provides evidence for the fact that, while other areas might've anticipated waves of this caliber, this area had not.

Many key political figures and experts in disaster management are disagreeing with the construction of larger and stronger seawalls. Tsuneaki Iguchi, who was acting mayor of Iwanuma, located just south of where the 2011 tsunami touched land, makes his opinion known when he comments, "we don't need the sea wall to be higher. What we do need is for everyone to evacuate," (Kurtenbach, 2015). Iguchi believes that investing in seawalls will take away from the prioritization of evacuation during future disaster.

Margareta Wahlstrom, head of the U.N.'s Office for Disaster Risk Reduction, similarly argues that, "too heavy a reliance on such safeguards can lead communities to be too complacent at times" (Kurtenbach, 2015). The consensus among the experts seems to be that building such a large wall would give people a false sense of security that would take away from their motivation to practice and familiarize themselves with existing mitigation strategies and evacuation procedures.

Costas Synolakis, an expert in tsunami research, also disagrees with the construction of larger seawalls. Synolakis was one of the first to make a statement regarding the reconstruction of the walls, when he said the following:

“I think the new thinking that we're developing worldwide is that we have to build community resilience. This sounds holistic, but in fact it's much more than that. A resilient community to coastal hazards needs to have resilience which means essential redundancies in anything, energy, transportation, water, emergency management, housing, everything. If you overestimate or overinvest in one part of the system, like building coastal defenses, and then you do not invest in the other parts of the system, like backup systems or redundant systems, then, you get what we just saw” (Synolakis, 2011).

Rather than building a large seawall to keep the tsunami waves off of the land, and figuratively putting all of the eggs in one basket, residents should be encouraged to move uphill and become familiarized with evacuation procedures.

Changes that have been seen

Despite expert opinion, Japan began plans for 400-kilometre chain of cement sea walls four years after the tsunami's 2011 occurrence (Kurtenbach, 2015). As of 2017, six years after the disaster being explored, only 22% of the seawall has been constructed (Kyodo, 2017). Residents of the area are complaining of obstructed views, not to mention the constant noise associated with the walls construction. While this wall was originally supposed to be completed over a year ago, the projected completion date is now March 2021, an entire decade after the deadly tsunami that inspired its creation.

Areas that need improvement

The physical measure being constructed to protect against future disaster, according to experts, is likely to have the opposite effect. As it provides a false sense of security to residents living in the area, it also deters them from engaging whole-heartedly in evacuation training. The physical measure used to protect Japan in this instance can be seen as part of the second theme and as a borrowed strategy. Despite several experts

advising against it, Japan continued to follow the footsteps of neighbouring developed countries and begin construction anyway. The billions of dollars that have been invested in this single structure could have gone toward transportation, social support structures and community resilience that would have dramatically increased the chances of survival, for people with and without disabilities, in future disaster.

Black Saturday

Background

The Black Saturday bushfires refer to Australia's worst ever bushfire disaster which began on February 7, 2009 (Niven, 2014). While sweeping across the state of Victoria, these bushfires took the lives of 173 people while destroying over 2000 buildings and leaving an estimated 7,562 people displaced from their homes (Australian Government, 2017). As the "driest of all inhabited continents" (Australian Government, 2017), Australia is all too familiar with disasters of this nature, and yet none as severe as the ones brought by Black Saturday. The severity of the bushfires during this particular disaster can be attributed to a combination of many geographic and geological components, including: hot climates, dry conditions, and a plethora of eucalyptus trees which contain large amounts of oil that can burn very fast and very hot (Australian Government, 2017). The deadly combination of these factors resulted in roaring fires that, with suddenly changing directions, managed to trap civilians in their homes just as they thought the danger had passed (Niven, 2014).

Of the deaths that occurred as a result of the 2009 Australian bushfires, 44% were considered "vulnerable" because they were aged younger than 12, older than 70 or

because they were diagnosed with an acute or chronic illness or disability (Parliament of Victoria, 2010, pp. 335). This statistic illustrates the importance of incorporating seemingly minute groups of people into disaster management solutions, as nearly half of the deaths that occurred on Black Saturday included individuals below or above the ages of maximized motor functioning, and individuals that were living with disabilities. To further elaborate on this point, “research shows people with disabilities are twice as likely to die or be injured than the general population during a disaster. They are also less likely to receive aid and less likely to recover in the long-term” (Kilham, 2014). With the research proposing that individuals with disabilities are more at risk during disaster, as well as the alarming 44% of fatalities during Black Saturday relating to disability, the importance of incorporating disability into disaster management is more important now than ever before. The following section will summarize Australian efforts during and after the occurrence of Black Saturday, and emphasize the disproportionate affect that was had on individuals living with disabilities.

Communication

Expert recommendations

One of the major problems with the ‘extreme fire danger alert’ sent out on February 7th, 2009, was that warnings of this caliber were a relatively common occurrence. Extreme fire alerts are not uncommon in the hottest parts of Australia, and nothing stood out about the fire warning that day which would notify residents of the phenomenal speed of the fires that were described then as, “unimaginable” (Malkin, 2009). The first theme of preparedness can be directly related to this problem, as Australian officials likely thought that warning residents of ‘extreme fire danger’, was

enough to motivate for evacuation. The reality of the situation, however, is that residents were left without sufficient warning, leaving many of them unaware of the severity of the surrounding fires. After the fires:

“Many victims complained of an apparent disconnect between the warnings on the radio, and the proximity of the fires. Several people said they were told the nearest blaze was an hour away, only to see flames encroaching on their property minutes later” (Malkin, 2009).

Following Black Saturday, and the apparent communication failures, came the release of the 2009 Victoria Bushfires Royal Commission Final Report. The final report had many recommendations, one of the first relating to the communication of the impending disaster. The report stated that, “the government should develop better warning systems and ways to disseminate information about fires” (Malkin, 2010). This recommendation is particularly important as it relates to individuals with disabilities, as having meaningful warning regarding the severity of the bushfires could have been the difference between life and death in many instances.

Changes that have been seen

Within 7 months of Black Saturday’s communicative failures, the recommendations from the 2009 Victoria Bushfires Royal Commission final report were put into effect. Rather than relying on commonly-used warning systems, Australia has introduced terms like ‘code red’ and ‘catastrophic’ to differentiate between the deadly fires seen in 2009, and ones that may not be as hazardous (“‘Code red’: bushfire warning system overhauled,” 2009). While a change in terminology may seem minimal, it is important to recognize how quickly Australia acted on expert recommendation.

Today, the warning system that is used in Australia can be referred to as, “The Standard Emergency Warning Signal (SEWS)”. The SEWS creates a distinctive siren sound to alert the community of an urgent safety message relating to a major emergency or disaster (Department of Fire and Emergency Services, 2017). The warning system is essentially the same as it was in 2009, though it is able to warn residents more effectively and has extended the number of platforms that the system is able to reach. For example, “residents in bushfire-prone areas will be warned of the danger by text messages or recorded messages on landline” (“Code red’: bushfire warning system overhauled,” 2009). While considering the high percentage of Australians with disabilities that had their lives taken by the fire, making the warnings accessible through different platforms is an important step in the right direction. While reflecting on the second theme of borrowing strategies, this solution fits right in. Technologically enhanced warning systems are one of the most effective and commonly seen disaster mitigation strategies, which most developed countries seem to have adapted. Having the most advanced warning will allow individuals with and without disabilities more time to evacuate safely, and minimizes the risk of being entrapped by the impending flames.

Areas of needed improvement

Despite key changes that were implemented shortly after the bushfires on Black Saturday, experts in recent years have continued to criticize Australian tendencies to exclude the needs of individuals with disabilities from their disaster planning. As the country works hard every year to prepare for the bushfires, “the early warning systems and public awareness campaigns are often failing to consider the needs of persons with

disabilities” (Kilham, 2014). It is essential to make public awareness campaigns accessible to individuals of all abilities so that the seriousness of bushfires is effectively communicated and people are properly motivated to prepare for them. This point brings to light the third theme of accessible infrastructure, and whether or not individuals with disability are prioritized outside of the disaster scenario. Australia would benefit from making complicated websites more easily accessible to all users, and from working to include disability in their public awareness campaigns that occur at the beginning of each bushfire season.

Evacuation Planning

Expert recommendations

On Black Saturday, Australia’s primary evacuation strategy revolved around the concept of “prepare, stay and defend or leave early” (Parliament of Victoria, 2010, pp. 338). This essentially means that individuals who were not able to defend against the flames, for whatever reason, were encouraged to leave as soon as possible. After spending 17 months hearing from more than 400 witnesses, the 2009 Victoria Bushfires Royal Commission decided that this policy was ‘sound’, but needed revision (Malkin, 2010). The revisions that were recommended by this commission included, “building bush fire refuges and shelters in vulnerable areas, buying land back from home owners who are living in the most at risk parts of the countryside, and implementing a new emergency evacuation strategy” (Malkin, 2010). While some of the suggestions, such as developing entirely new strategies, may seem vague, the recommendation of buying at-risk land back from home owners is one that seemed to surface again and again among experts.



Figure 4: Police officers and volunteers search through remains of burnt down property in Bendigo, Australia following Black Saturday (Foley, 2009).

Another recommendation, regarding evacuation planning, is to develop a system that can quickly identify the speed at which flames are spreading. The final report, following the 2009 bushfires, notes that, “four of the five major fires spread two or three times faster than predicted” (Australian Government 2017), which resulted in residents not being adequately prepared for evacuation. With increased knowledge regarding the speed of the impending fires, residents would have more time to go over their evacuation plan and exit the area safely.

With naturally occurring disasters, however, it is important to be prepared to pick up and go at any time. With or without sufficient warning about the speed at which fires are approaching, a well-practiced evacuation plan can be executed at the drop of a hat. At the time of the fires, this was not the case for many residents. During Black Saturday, many people were not prepared for the severity of the flames, resulting in, “a considerable amount of last-minute planning and preparation” (Australian Government,

2017). As a result, the final recommendation is to have residents of the area practice evacuations on a regularly occurring basis. Practicing evacuations, while a seemingly obvious approach to disaster mitigation, still acts as an extension of the second theme and can be considered a borrowed strategy.

Changes that have been seen

In response to the recommendation made regarding land buy-back, the Australian Government developed a \$25 million bushfire-buyback scheme in 2013 to do exactly that. Within these four years, up to 116 properties were bought by the government in order to allow victims the opportunity to move away from the high-risk areas (White, 2015). Though the intention was for the properties to resell, there have since been restrictions on the redevelopment of homes in that area, to prevent future land owners from being at risk.

Though the recommendation to increase the number of fire shelters has not received much attention from the government, the sale of independent fire bunkers has grown rapidly since Black Saturday. Sales have increased so much, that they are now legally obligated to, “comply with the Victorian Building Regulations 2006 (Regulations) and the National Construction Code (NCC) performance requirements” (“Private Bushfire Shelters or Bunkers,” 2017). In addition to the regulations that private shelters are required to follow, owners must also obtain permits and licensing to ensure that bunkers are able to provide adequate safety. Therefore, despite the lack of attention that this recommendation received from the government, the obvious need for it led to its creation on a private level. Though this disaster varies greatly from that of the tsunami,

the same problem was seen regarding the evacuation towers. Government bodies were unable to provide protection from disaster, and so privately-owned businesses began to develop their own for independent sales; this can be grouped with theme two of borrowed strategies.

While there hasn't been an entirely new evacuation strategy implemented in Australia, research has since revealed access routes that could have brought people to safety during Black Saturday, and which could lead them to safety in the case of future disaster. Researchers, from RMIT's School of Business IT and Logistics, modelled evacuation plans based on the number and capacity of shelters and the number of vehicles available during the Black Saturday catastrophe. According to their findings, the central location of the town of Alexandra would have provided shelter enough for every person, with the added convenience of Maroondah Highway serving as an arterial link to all parts of the region. This research concludes that, "more than 59% of 'short notice' Black Saturday evacuees could have effectively transferred to key shelters via Maroondah Highway, due to its high capacity, high-speed road connectivity" (Lambert, 2016). Though entirely new evacuation strategies were not implemented, increased knowledge will allow for individuals with or without disabilities to be aware of their exit points and plan for future disaster.

Areas of needed improvement

The buy-back scheme of 2013 is undeniably a positive movement for victims of Black Saturday who are trying to move away from high-risk areas. However, within the last couple of years, the Australian government has been having trouble reselling the

property, since building new homes on the land is prohibited (White, 2015). As a result of this, the government may not have the opportunity to make any of the money back, which may result in a deficit that will restrict future funding of disaster management initiatives.

For individuals with disabilities planning for bushfire evacuation, the recommendation is still to 'leave early'. The Bushfire Collaborative Research Centre did research in recent years and discovered that the majority of people choose to 'wait and see' what the danger really is. The report confirms that, "less than 1% would leave their house on days of extreme or catastrophic danger" (Kilham, 2014). To further emphasize this point, the United Nations Office for Disaster Risk Reduction found that even with sufficient time and warning, 4% of people would be unable to evacuate their homes (2013). Given these statistics that have surfaced in the years following Black Saturday, it becomes clear that, for individuals with disabilities especially, it is crucial that a more inclusive and detailed evacuation plan is developed.

Disability experts continuously make the point that the disabled population will continue to be excluded, until they are involved in decision making and planning on every level. This includes involvement in the, "consultation, planning and preparedness stages of thinking about disasters" (Kilham, 2014). Full inclusion of individuals with disabilities in the planning stages would help to identify risks they can predict and ultimately lead to increased chances of survival if another disaster were to occur. With reference to the first theme of preparedness, having individuals with disabilities involved in infrastructure planning would benefit both everyday life as well as disaster mitigation, as the two are positively correlated.

Transportation

Expert recommendations

As mentioned earlier, Australia's evacuation strategy is based on the saying, "prepare, stay and defend or leave early". For people who are unable to stay and defend, the assumption is that these individuals will leave early. While considering the daily transportation struggles that individuals with disabilities regularly encounter, it is easy to imagine how amplified these struggles become by the pressure of an impending fire. For a person with a disability, these added difficulties that come from leaving early can result in, "leaving behind essential equipment at home that is needed for daily living" (Kilham, 2014). Rather than rushing and leaving essential equipment behind, the tendency is for individuals with disabilities to 'wait and see' (Kilham, 2014). The unfortunate truth, however, is that waiting to see if the fires get worse will leave individuals with less time to evacuate, resulting in more rush and likely more difficulty. Additionally, waiting for someone, "to turn up and 'rescue' a person with a disability means someone is going to be forgotten and the catastrophic outcome is real" (Kilham, 2014). Therefore, the recommendations regarding transportation during an emergency evacuation in Australia tend to revolve around the idea that people need to be individually prepared to the best of their ability, and recommend only reaching out to emergency services when they are left with no other options.

Changes that have been seen

In May 2011, two years after Black Saturday, new Australian federal legislation was introduced to provide further access to buildings for individuals with disabilities. While the new access codes do not specifically address evacuation procedures for this

population, “there are still legal obligations that need to be met under the Federal Disability Discrimination Act 1992 (DDA) and Occupational Health and Safety (OHS) legislation” (Bromley & Livanos, 2012, pp. 100). This newly introduced legislation makes it a legal obligation for 50% of the ground floor exits to be accessible, encourages building owners to provide ‘evacuation chairs’ so that individuals can be transported easily down the stairs in an emergency, and also encourages the incorporation of refuges into stairwells where individuals with disabilities can wait for emergency personnel without being in the way of fellow evacuees (Bromley & Livanos, 2012, pp. 101).

Though not all are legal obligations, the introduction of this legislation has made it so that new builders are working hard to incorporate these accessible designs, which will make transporting in and out of buildings less of an obstacle. The benefit of having wheelchair access to buildings will benefit Australian’s with disabilities both in disaster scenarios and outside of them, further emphasising the third theme which discusses the relationship between accessible infrastructure and disaster mitigation. Many other developed countries have additionally made accessible buildings a legal requirement, allowing this point to simultaneously align with the second theme, borrowed strategies.

Areas of needed improvement

Despite new legislation making buildings more accessible, there are still many flaws that could interfere with the transportation of individuals with disabilities during an evacuation. For starters, requiring only 50% of the exits to be accessible presents the first problem:

“In the event of a fire or other emergency, where the main access points are not able to be used, occupants will be forced to find other exits. If these exits are not

accessible, it presents an obvious safety concern for people with a disability” (Bromley & Livanos, 2012, pp. 101).

This problem not only presents difficulties during the evacuation itself, but during everyday living, further emphasizing the first theme of preparedness. It is unfair to limit the entry options for individuals with disabilities, whether or not their lives are depending on it. Another problem area that exists is that evacuation chairs are not an obligation. While evacuation chairs are great for transporting wheelchair bound citizens to the ground level, the sole reliance on elevators may leave people trapped on higher floors in the event of a power failure or other emergency that renders the elevators useless. The final problem is the refuges in stairwells that are designed for individuals waiting for emergency personnel. In a lot of cases, the emergency respondents, “may not be aware of the refuge, or fire could block access to the refuge, placing a person with a disability at risk. Ultimately, the only safe place in an emergency is outside the building” (Bromley & Livanos, 2012, pp. 101). Again, stating that outside is a safe place works only under the assumption that a bushfire has not yet reached that area, and that emergency personnel have enough resources to transport all citizens requiring assistance to safety. While considering the third theme, it is important to recognize the difference between seeming preparedness, and the level of preparedness that actually exists. Though this legislation is a definite step in the right direction for the disabled community, transportation in the case of an evacuation is an area that needs more attention.

Physical Measures

Expert recommendations

The bushfires in Australia are generally caused by nature and people. While they are naturally occurring disasters, the physical measures used by people play an important role in how far they spread. For example, planting things such as Cyprus, pines and eucalypts near a house made of wood is an easy way to ensure that you and your family will go up in flames. Those trees and building materials, in particular, are extremely flammable and are not recommended in bushfire-prone areas. Gardening expert, Sabrina Hahn, recommends planting fire retardant trees as they act as a physical barrier to heat, protect houses from the embers of nearby bushfires, and are able to physically stop the fire from moving through as a result of the moisture in the leaf tissue of the plant (O'Shaughnessy, 2014).

After Black Saturday, experts were also quick to recommend making it a requirement for future homes to be built with fire-resistant materials. Having this regulation would ensure that bushfires are not spreading any more than they were meant to naturally. While physical measures play an important role in the protection of people and their homes, one of the most common recommendations is to disallow homes to exist in those areas.

Changes that have been seen

In late 2011, two years after the occurrence of Black Saturday, the state of Victoria had its most bushfire-prone areas entirely mapped out. With this, citizens of Victoria are now required to find the Bushfire Attack Level (BAL) of the area in which they reside, and ensure that the building materials of their home meet the requirements

set out for them by the Victorian Building Authority (“Victorian Building Authority, 2017). As mentioned earlier, victims who have had their homes destroyed by Black Saturday bushfires were likely involved in the bushfire buy-back scheme of 2013 (White, 2015). Building in these areas that were drastically affected is prohibited, meaning that these people will likely move to places with a lower BAL, and ensure that their homes meet the aforementioned requirements. These same requirements dictate what vegetation is permitted and how close it is allowed to be to each person’s home, depending on their BAL. Having these assessments regularly has undoubtedly helped to ensure a higher level of bushfire safety in the most fire-prone areas. When a developed country is highly prone to a certain type of disaster, it is not unlikely for them to have regulations that will help to physically deter damage to homes. In this sense, the second theme of borrowed strategies can be applied to this point.

Areas of needed improvement

Even with the regulations put in place by the Victorian Building Authority, it is still considered a highly dangerous place to reside. However, the population of this area continues to grow at 1.8% each year (Nivens, 2014), meaning that people are prioritizing the ideal conditions that exists there most of the time, over the potential disaster that the bushfires may bring. Danielle Clode, author of ‘A Future in Flames’, a personal account of Black Saturday, describes the benefit of living in Victoria and why people will continue to move there. Clode describes the memory and capacity to prepare for fires as very poor, stating that people, “live in paradise 99% of the time... [with a] 1% chance it will turn to hell” (Niven, 2014). While protecting against bushfires with proper building

materials and vegetation is essential, the natural hazard that exists in Victoria is one that cannot be completely eliminated or forgotten. This is particularly important while considering the obstacles that individuals with disabilities will face during the onset of this type of disaster.

Discussion

The three natural disasters, developed countries and major themes all worked together throughout this paper to reveal information regarding the relationship between natural disasters and disabilities. The first theme of preparedness provided evidence for the fact that, despite how conclusive mitigation plans may seem, individuals with disabilities continue to be left at a disadvantage. This theme emphasises the fact that it is not only important for key stakeholders to continue making the recommendations, but to also follow through with implementation and continued practice. Without action being taken immediately, the sense of urgency tends to quickly fade. An example of this can be seen with regard to Japan's protective seawall, which was supposed to be completed last year and has been pushed forward until 2021 (Kyodo, 2017). The further away the disaster becomes, there seems to be less motivation to continue with disaster planning. Another example of this can be seen in Australia's high-risk bushfire areas, as the population of residents begins to grow, only eight years following the devastation that was brought by Black Saturday. Immediately following a natural disaster, everyone seems more than willing to prepare for the next one, but as time goes on, people have a tendency to forget the urgency (Niven, 2014). In the same way, when individuals with disabilities are disproportionately affected by disaster, this issue tends to receive the

media attention that it deserves and appears as a priority for a short while. As time goes on, there is less of a perceived threat, and accessible mitigation slowly makes its way toward the back of the agenda. This cycle is ironic, however, because these disasters are often unpredictable, and unlikely to occur as severely within a short period of time.

The second theme of borrowed strategies reveals a lot about the importance of global information sharing; advances made in one area were shown to quickly spread to the others. Unfortunately, however, in the cases that were examined, it took the occurrence of catastrophic events for countries to realize the need for further mitigation. Strategies such as technologically advanced warning systems, online disability registries, protective seawalls and obligatory practices can be seen many times throughout the entirety of this paper, providing evidence for the fact that developed countries are learning from one another. While borrowing ideas from other countries may be seen as a negative practice in the business world, it is encouraged when it comes to disaster mitigation, as it is in everyone's best interest. This borrowing of strategies can be seen as a primarily positive venture, except for the one instance in which Japan's seawall was openly frowned upon by experts. The sense of false security, in expert opinion, was said to outweigh the importance of the land's physical protection (Kyodo, 2017). Though Japan went against this recommendation by commencing the construction of the seawall, the prolonged process has allowed for a few more years without, which is hoped to encourage more disaster planning among residents of the coast.

The final theme, regarding the relationship between accessible infrastructure and accessible mitigation, worked well to emphasise the importance of planning outside of a

disaster setting. Emergency evacuations are really just a means of getting yourself and your loved ones to safety. If a person with a disability has difficulty getting around on an everyday basis, it is only going to be more challenging when they are hurried and trying to avoid nature's life-threatening elements. It is also important to consider life after disaster, and how much of a struggle that proved to be in countries that did not prioritize the needs of individuals with disabilities. Japan contributed largely to this theme by being a country that is not known to prioritize disability, but still considers itself to be a leader in disaster mitigation. When put to the test by the tsunami, individuals with disabilities were at an extreme disadvantage, often relying solely on their able-bodied loved-ones to bring them to safety. Life after the disaster, as a result of inaccessible infrastructure, was made just as difficult. After learning of the relationship between infrastructure and disaster planning, Japan has taken steps to build accessible shelters for those affected by the tsunami. It is hoped that going forward, Japan will recognize the importance of accessible infrastructure outside of emergency scenarios and prioritize disabilities in all of their planning.

A lesson that can be learned from all of the disasters, countries, and themes combined, is the importance of participation. The involvement of individuals with disabilities throughout the entire planning process is an essential component to disaster mitigation, as these individuals are sure to know the most about their own needs. While ability can vary from person to person, individuals who have experienced these types of inequities first hand will undoubtedly be the best reference while planning for the future.

Thus far, this paper has examined disaster mitigation efforts of 2005, 2009, and 2011, as well as the efforts that have been made to improve on their shortcomings. This year, 2017, has brought about disasters, such as Hurricane Harvey, that are the costliest of all time, and yet disaster mitigation has made it so that death tolls are significantly lower (Willingham, 2017). Despite the criticisms that exist regarding the accessibility of disaster mitigation, it cannot be denied that evacuation planning has come a long way in recent years. While the recentness of Harvey limits the amount of available literature, future research may consider investigating the accessibility of this disaster's mitigation, and whether or not expert recommendations are implemented in the years to come. Future research may also consider the sole examination of one type of natural disaster, in order to elaborate further on the specific mitigation measures that are in place.

Conclusion

The goal of this research paper was to analyze natural disaster mitigation as it relates to disability, as a means of identifying areas of needed improvement. The major themes that were emphasised include the overestimation of preparedness, the borrowing of mitigation strategies and the accessibility of social supports as they exist outside of crisis scenarios. Together, the themes worked to highlight the existing problem areas that developed countries should focus on during the planning process of future disaster mitigation. It is hoped that emphasising the slow pace of implementation will encourage stakeholders to act more efficiently on expert recommendations of the future. It is also hoped that this paper will add to the ongoing discussion of disability and the disadvantage individuals with disabilities continue to experience. Another important element of future

planning should involve the full participation of individuals with disabilities during every stage, as they are sure to be the most knowledgeable with regard their own needs. The combination of being adequately prepared, sharing expertly supported mitigation strategies, ensuring accessible infrastructure, and including individuals with disabilities in the planning process, can and should lead to effective disaster mitigation that protects all citizens. It is hoped that the lessons learned from these three chosen disasters are applied to disaster planning in developed countries around the world, so that fully accessible disaster mitigation becomes the new norm.

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