Haiti, Northridge and San Diego: Examining Vulnerability

A natural disaster can strike anywhere in the world and at any time. While a disaster cannot always be anticipated, they can be planned for and their effects can be mitigated through both planning and policy efforts. These planning and policy efforts are the key to providing useful mitigation and recovery strategies which will help a given population to bounce back following the events of a natural disaster. However, it is precisely because of the lack of effective policy and planning efforts, or more specifically the lack of ability to plan and mitigate results in dramatic disparities in disaster event outcomes. Typically, these disparities tend to disproportionately follow socio-economic lines. In other words, the poorer a given community is, the more likely they are to have been negatively impacted by the natural disaster.

In examining the nature of this disparity between rich and poor communities and their disaster outcomes it will be helpful to use two separate examples to serve as illustration. To that end we will examine the 2010 earthquake in Haiti and its aftermath, and the 1994 Northridge earthquake which struck Los Angeles County in the early morning hours. These two disasters had vastly different outcomes and responses, much of which can be traced back to policy decisions which had, or had not, been made years in advance. This examination will help us to see how the socio-economic situations specific to these two disasters helped produce their differing results.

So, what is a disaster? The International Red Cross defines a disaster as, “...a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community’s or society’s ability to cope using its own resources. Though often caused by nature, disasters can have human origins.” For the purposes of our own discussion we will be focusing solely on ‘natural’ disasters, and specifically on the effects of the two earthquakes already stated. While others types of disaster are important, these two examples are particularly well suited to explore the impact of vulnerability on disaster outcomes.

Vulnerability is another concept which requires a definition. Again, the International Red Cross uses the following: “Vulnerability in this context can be defined as the diminished capacity of an individual or group to anticipate, cope with, resist and recover from the impact of a natural or man-made hazard.” Vulnerability therefore, fluctuates depending on the circumstances in the particular area where a disaster may strike. All places are vulnerable to some extent, but policy and prevention measure can help to mitigate the outcomes resulting from a disaster scenario.

Complementing the idea of vulnerability is that of capacity. Capacity is basically the resources available which help to resist, cope with, or mitigate the impacts of a given hazard. These resources could be societal or physical in nature but ultimately help the impacted community to cope with the impacts of a disaster.

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1 International Red Cross: http://www.ifrc.org/en/what-we-do/disaster-management/about-disasters/what-is-a-disaster/
2 Ibid.
3 Ibid.
When we couple these two ideas to a disaster we can begin to see and examine how different communities have been able to respond to and recover from the events which have impacted them. Further, by focusing on *mitigating* vulnerability and *building* capacity within communities, policy can help to create positive change which will hopefully reduce the cost of disasters in lives lost, money spent, and time taken in recovery.

**Haiti in 2010**

The earthquake that struck Haiti in 2010 was devastating in the sheer amount of damage caused across the country. The earthquake registered a 7.0 magnitude when it struck outside of Port-au-Prince early in the morning on January 12th. This quickly resulted in widespread devastation throughout the city and surrounding communities, and eventually caused considerable hardship on the people of Haiti as a whole.

A heavily populated city, over 3.5 million people were directly impacted as a result of the earthquake. While the degree of impact varied from person to person, the sheer number of people impacted would eventually create logistical strain on the capacity not only of Haiti to respond, but also the international community. Along with the 3.5 million affected, over 220,000 people were estimated to have died as a result of the disaster and another 300,000+ were injured.

Many of these injuries and deaths were the result of poor infrastructure in Haiti. In particular, there over 200,000 homes and buildings that were either badly damaged or destroyed by the effects of the earthquake and its aftershocks. The destruction of these home and buildings immediately resulted in the displacement of a substantial population of the city of Port-au-Prince. This population, estimated at around 1.5 million, had to immediately find a way to survive in a landscape which had been dramatically changed, and without access to the limited resources they had access to prior to the disaster.

These impacts were felt immediately, and would quickly hinder the recovery efforts which would quickly be overwhelming to the capacity of Haiti as a whole. Further, the massive death toll had claimed approximately 25% of all of the civil servants working in and around government in Haiti. This represented a substantial portion of the experience of running the government, and directly impacted the ability of the government to respond to and cope with the effects of the disaster on the population.

Hand in hand with the loss of civil servants was the destruction of over 80% of the government and administrative buildings in Port-au-Prince. This directly impeded the ability of the government to work effectively in addressing the recovery efforts following the earthquake. While the government was still able to function, it was not

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5 Ibid.
6 Ibid.
7 Ibid.
8 Ibid.
nearly as effective or capable as it could have been due to the loss of its buildings and equipment.

The longer term impacts of the earthquake are harder to see, but we can make a few assumptions based on the extent of the damage to other sectors of society. For instance, 4,000 schools (over 60%) were either damaged or destroyed as a result of the earthquake. Education, it can be argued, is an extremely useful tool in helping to mitigate and recover from a disasters impact. While some of these schools have been rebuilt in the years since the disaster, there is the potential for long term damage to the education system of Haiti and its ability to produce the citizenry it needs in order to fully recover from the effects of the earthquake.

With so much damage to housing and buildings throughout Port-au-Prince over 600,000 additional people were forced to take residence with friends and family throughout the country, or even internationally if the resources were available. This placed an additional strain across Haiti, its economy, and again served to impede the recovery efforts of the state and international community.

Eventually, refugee camps sprung up throughout Port-au-Prince and the surrounding communities. Though many of these were not regulated camps, they served the basic purpose of providing some form of shelter for the people impacted by the disaster. However, that shelter was likely no more than a thin wall with little in the way of roof or sanitation available. With close to 1 million people living in these camps, the vulnerability of the population increased dramatically and was easily impacted by subsequent events. In particular, many of these camps were at critical risk of floods following tropical storms which are common throughout the region. In the event of such a storm, many of these camps would not have been able to withstand their effects and the population would have been impacted again.

One other impact resulting from these camps was the increase in communicable disease among the population. While these people may have been able to receive medical attention, they were now limited in their access to medical care as a result of the earthquake. Further, the importation of Cholera, which had no history on the island, quickly impacted the population. This disease was likely imported via United Nations personnel from other countries who had previously contracted the disease and were serving in the Haiti relief efforts. The importation of this disease has resulted in an ongoing disaster which impacted a population made more vulnerable by the earthquake. As a result, Haiti will continue to cope with the continuing effects of the Cholera epidemic.

All of these impacts on Haiti have obviously caused a great deal of pain and suffering on the people living in these communities, but just knowing what happened doesn’t help us to understand why it happened, nor how it could have been mitigated and planned for prior to the earthquake’s strike.

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9 Ibid.
10 Ibid.
12 See Figure 1 for a current map of vulnerability areas for Cholera in Haiti.
Before the earthquake in 2010 Haiti ranked 145th of 169 countries in the United Nations Human Development Index\textsuperscript{13}, and now ranks 161\textsuperscript{st}\textsuperscript{14}. What this shows is that Haiti was already exceptionally vulnerable to the effects of a disaster. In essence, Haiti was not able to provide even basic needs for its citizens prior to the disaster, and therefore it would obviously have had limited capacity to assist subsequent to the disaster’s impact. In terms of basic income, the people of Haiti were largely subsisting on less than US $2 dollars per day. This emphasizes the potential impacts on chronic poverty on a community’s ability to cope with, respond to, and recover from the impacts of a disaster on their community\textsuperscript{15}.

Many of the deaths and injuries as a result of the earthquake can also trace their cause back to the conditions which existed in Haiti prior to the earthquake. To this point, most of the buildings in Port-au-Prince were not built in accordance with modern building safety codes which taken into account the possibility of earthquakes. Furthermore, approximately 86\% of the people living in Port-au-Prince were packed into slum-like conditions within poor quality concrete buildings\textsuperscript{16}.

These buildings, including government buildings, quickly collapsed due to the strength of the earthquake. This, again, is something for which the government of Haiti could have planned for and potentially mitigated in response to a potential earthquake. However, disasters are typically only useful for policy change in immediate hindsight. Once they are far enough out of recent memory their power to create change is diminished.

Coupled with these poor building conditions was also limited access to clean water and sanitation\textsuperscript{17}. Following the earthquake, what little access there had been to these necessities became non-existent in Port-au-Prince and the surrounding areas. This exacerbated the problem of communicable disease in the transient refugee camps, and was extremely important in the relatively fast spread of Cholera once it had been introduced to the island.

In examining these issues we can begin to see how issues relating to the vulnerability of a given population can have such a dramatic impact following a disaster event. In this particular case the government of Haiti had done little to no prior planning for an earthquake event striking Port-au-Prince, or any other part of Haiti. This lack of concern for an earthquake can largely be attributed to the fact that none had occurred within recent memory, and those that had occurred had not been of significant magnitude or as close to a population center.

This, coupled with the chronic poverty of the population, and the lax building standards helped to create a situation in which the impact of an earthquake would produce devastating results. The same earthquake, striking in a vastly different community would likely produce different results. The importance of vulnerability in understanding disasters cannot be understated. The vulnerability of a population largely

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\textsuperscript{13} UN Human Development Index, 2009.
\textsuperscript{14} UN Human Development Index 2013: http://hdr.undp.org/sites/default/files/hdr2013_en_summary.pdf
\textsuperscript{15} DEC, UK.
\textsuperscript{16} Ibid.
\textsuperscript{17} Ibid.
will drive the resulting effects of a given disaster. Further, it will help to drive planning and mitigation techniques which hopefully improve the circumstances of the affected population.

In shifting out focus from Haiti we will quickly see just how different the results can be between disasters. With the Northridge earthquake in Los Angeles County we will quickly see a notable difference in the vulnerability and capacity of the population, and its resultant effects.

**Northridge 1994**

In terms of magnitude, the earthquake which struck LA County early in the morning of January 17, 1994 registered at a 6.7. The earthquake did not strike directly within a population center, with its epicenter 20 miles outside of LA, but its impacts were felt over an exceptionally wide area. The quake was felt over a range of 2500 miles, but its greatest impacts occurred closer to the epicenter\(^8\).

Damage was immediate in some areas of the county, and eventually 57 deaths could be attributed directly to the quake activity. With these deaths there were an additional 12,000 estimated injuries, and over 114,000 people made homeless as a direct result of the damage. In comparison with the earthquake in Haiti 16 years later we can already begin to see a disparity in terms of outcome. While the earthquakes are not perfectly analogous, they still provide a useful example for the comparison of vulnerability and capacity.

Due to outdated building codes in some older buildings an approximate 449,000 homes and apartments were damaged or destroyed, along with another 9,000 public buildings. Many of the buildings which suffered the greatest damage or destruction were built in the 1970s before California adopted more stringent earthquake building standards. In the end, this damage and destruction resulted in over $20 billion in damages, which at the time was the costliest disaster in US history\(^9\).

Even with the vast damage LA County was still better equipped in terms of capacity and vulnerability than Haiti was 16 years later. While not exact to LA County, the median household income in the US in 1994 was $32,364, significantly more than was seen in Haiti 16 years later\(^10\). The impact of this money helped to make the population affected by the Northridge earthquake less vulnerable to the disaster, and created a greater capacity with which the people affected could respond to and recover from the event.

Along with this damage, LA County lost approximately 25% of its power infrastructure and took two weeks following the earthquake to repair. Further, many water lines and gas lines which had been in the ground in excess of 30 years burst as a

\(^9\) Ibid.
result of the vibrations resulting in numerous fires, and a boil order being placed on water for two weeks to ensure potability\textsuperscript{21}.

Again, these damages are significant, but unlike in Haiti there was a capacity for response which could speed the recovery effort. In drawing on the example from Haiti, which had little to no access to potable water even before the quake, we can see that the Northridge quake had even less of a chance of producing similar results because of the increased capacity of the LA County water supply system to conduct repairs, and distribute appropriate information to the population in order to mitigate the effects while repairs were taking place.

Ironically, the freeway system in LA County, which was heavily damaged in areas, had been undergoing retrofitting in order to better prepare for potential earthquakes. Even still, two of the overpasses which collapsed were thought to have been capable of withstanding an earthquake of the magnitude which struck. This points out a potential problem with policy controls for the mitigation of disasters. What if the policy is not enough? The Northridge earthquake shows us the limits, potentially, of our ability to plan accurately for disasters in the future. The only true test of building codes, for instance, comes when the disaster actually occurs. Until that time our policies implemented in order to mitigate disasters will remain untested.

The Northridge earthquake also provides another example of the vulnerability and capacity difference with Haiti in 2010. Specifically, the government of LA County, California, and the United States was able to act immediately to begin effective search and recovery operations in order to get the people impacted by the earthquake back on their feet. These relief efforts were effective and swift in implementation. The Mayor of LA was able to declare a state of emergency, and provide a curfew for the affected areas in order to help control the situation. Further, the Governor was able to provide National Guard troops for the recovery effort, as well as declare a disaster for the area.

These efforts mobilized the resources of the US government in responding to the disaster. For instance, both the Federal Emergency Management Agency (FEMA) and the Housing and Urban Development Department (HUD) were able to rapidly respond the disaster and provide assistance to the displaced. FEMA was able to house many of the people rendered homeless due to damages caused by the earthquake. Further, this housing wasn’t nearly as haphazard as what occurred in Haiti, and the infrastructure already in place in LA County was better able to provide for the needs of the displaced.

Another differing factor from the Haiti Earthquake was the comparative lack of density of the population of LA County with just over 2,000 residents per square mile\textsuperscript{22}. This lack of population density was a mitigating factor in the injuries and deaths that were a consequence of the Northridge earthquake. Haiti and specifically Port-au-Prince had a significantly greater population density coupled with poorer building standards which contributed to their overall vulnerability to a disaster scenario.

\textsuperscript{21} See Lowry, Hunter
\textsuperscript{22} See figure 2.
Perhaps most importantly with regards to the Northridge quake has been the ability of the government in enact and implement reforms in order to mitigate against the future potential of earthquakes in California as a whole. For instance, the Department of Transportation was able to speed up the implementation of the retrofitting of all bridges throughout California. This process had begun prior to the Northridge quake occurred in response to an earlier earthquake in 1989, but had not been completed at the time of Northridge. Of the bridges that had been retrofitted, none failed.

Also, the state of California the California Earthquake Authority in order to provide basic insurance for protection against earthquake damage. This was done due to private insurance companies ceasing to offer such coverage following the Northridge earthquake and the high volume of claims that were paid out. The state legislature was also able to pass a law which required all household water heaters to be strapped in place in order to attempt to prevent fires resulting when a water heater broke free as happened during the Northridge earthquake.

While these actions were all in response to the earthquake, and not done prior, they were simple policy adjustments the government made in order to attempt to mitigate future damage as a result of other disasters. Further, it highlights the difficulty Haiti has faced in implementing effective policy change when so much of the infrastructure of government had been destroyed during the 2010 quake.

The United States government and the state government of California had the requisite resources available in order to respond quickly and effectively to the onset of the disaster in LA County. The numerous organizations involved (FEMA, HUD, etc) were all able to coordinate their activities, through FEMA, and to effectively manage a rapidly changing situation and transition to a swift recovery effort. This stands in stark contrast with the Haitian response to the 2010 quake. As Paul Farmer points out in his book on the 2010 earthquake, the response to the quake was not very well managed, and many of the resources provided to the state in order to respond to the disaster were never utilized, or extremely slow in being used by state entities.

Again, this circles back to the ideas of vulnerability and capacity. The vulnerability in Haiti has been shown to be significantly greater in degree from that in LA County at the time of their respective earthquake. Further, the capacity of the two situations is vastly different. Haiti did not have significant capacity to continue functioning as an effective state following the earthquake’s destruction. LA County, and southern California more generally, already had in place significant capacity leveraging organizations which were able to respond quickly to the disaster event and surge resources in order to support a massive recovery effort.

Simply, Haiti shows us the importance of being able to identify the vulnerabilities present in a given community in advance of a disaster event. While there will likely not be pressure to do so, only by identifying vulnerabilities in advance can they potentially

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23 See figure 3.
25 See Lowry.
26 Farmer, Paul, Haiti After the Earthquake, 2012.
be mitigated. Further, a lack of capacity in Haiti points to larger systemic issues which can only be solved with a broad government-wide approach to solving the problems. The destruction of much of the government’s infrastructure in Port-au-Prince has necessarily hampered this from occurring rapidly. But how can we apply this information, however broad brushed, in order to attempt to mitigate potential disasters in the future? For that, we will briefly look at a couple of factors for the city of San Diego in regards to issues of vulnerability.

**San Diego County**

What are some of the factors we can use to examine potential vulnerability and capacity in San Diego County? For one, we can look at the level and concentration of poverty spread throughout the county. Figure 4 shows the regions of San Diego County and the density of populations in poverty within each region. What the earthquake in Haiti has shown is the impact of poverty on the ability of a population to withstand and recover from a disaster event. Therefore this map allows us to visualize the areas of San Diego County most likely to be negatively impacted by a potential disaster scenario, and particularly an earthquake.

This can and should be utilized to make informed policy decisions in order to improve the capacity of these regions to withstand the impacts of a major disaster. In other words, this provides a tool for addressing systemic issues with poverty in the San Diego county region and building potential solutions. While the solutions may not address fully the systemic nature of poverty, these solutions can at least help to prepare the region to react quickly in the areas to likely be most heavily affected by the impact of a major disaster.

Additionally, the data gathered via the US Census and other measure can be used to analyze the distribution of poverty among age groups and these locations in order to better direct policy efforts towards capacity building in these communities. The Center on Policy Initiatives September 2013 report on poverty levels in San Diego is an example of this type of analysis[^27]. With a poverty rate of 15% in the region there is a significant portion of the San Diego County population at increased vulnerability to a major disaster. Further, these communities are less likely to have the capacity to be able to fully recover from a disasters impact.

Furthermore, the report by CPI shows how Hispanics (or Latinos) and Black (or African Americans) residents have larger percentages of the population in poverty than other signifiers[^28]. This echoes poverty statistics across the United States. Again, this is an area for policy solutions by local, state and federal governments. By addressing systemic poverty inequities governments can help to mitigate the potential negative impacts of major disasters on their communities. In doing so, the likely costs associated with recovery efforts borne by the government are likely to decrease as the residents will have an increased capacity to recover without the need for additional assistance.

[^27]: Center on Policy Initiatives, 2013: http://issuu.com/episandiego9/docs/episandiego_censusreport2013final
[^28]: Ibid.
Another interesting statistic regarding San Diego County is that approximately 17% of the population does not carry any form of health insurance. How might this impact vulnerability and capacity in the local communities? Those without health insurance injured in a major disaster would be forced to pay for the costs of healthcare out of their own funds. While some may be able to cope with this situation, the percentage of the population in lower income brackets and in poverty that cannot afford health insurance would be struck again with another negative impact. These populations would likely be unable to pay for any health services required, and would therefore likely struggle to emerge from the debt incurred via injury during a disaster.

Again, addressing a lack of access to health care at an affordable level may help to increase the capacity of a community to deal with the impacts of a disaster, and will obviously help in addressing the vulnerability of a community in that people would have access to health care without the extreme debt burden incurred through self-coverage. It is possible that the Affordable Care Act will have some impact on this section of the population, and is a step towards addressing systemic issues with poverty and health care which could increase the capacity and reduce the vulnerability of certain communities and populations.

What we can begin to see through these two examples of poverty and access to health care is that many of the problems underlying a population’s vulnerability to a disaster are systemic in nature. However, San Diego County does have a thorough emergency management plan, good governance, and the capacity (on the whole) to effectively respond to a disaster scenario were one to strike in the future. For San Diego County the main effort in addressing vulnerability to a disaster and building capacity should be focused largely on the populations in poverty, or living in communities with a high density of poverty. Again, these are some of the most likely groups to be disproportionally impacted by the advent of a disaster on the county.

San Diego County is also subject to the same laws regarding construction codes as the rest of the state of California. As such, the County is likely better prepared to withstand an earthquake than Haiti was in 2010. Nonetheless, there are still areas and buildings in San Diego County where the buildings are not up to modern specifications. These buildings, especially those built in the 1970s or earlier, should be routinely targetted for retrofitting or reconstruction. Again, these are the buildings which would most likely suffer damage or destruction in the event of a major earthquake in the region. As such, these buildings would likely cause the most casualties on the local populations. By aggressively enforcing building codes and upgrades San Diego County can continue to reduce its vulnerability to a major earthquake.

San Diego County is largely well-suited to mitigate and recover from a major disaster event. However, further efforts can and should continue in order to decrease the vulnerability of local populations, and increase their capacity for recovery and mitigation.

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29 Ibid.
31 San Diego County emergency: http://www.sdcountyemergency.com/
Conclusions

The examination of the earthquakes in Haiti and Northridge was meant to provide to extremes in regards to community vulnerability and capacity in handling major disaster events. While we cannot predict with great accuracy when and where, nor of what type, a disaster will strike; these examples provide us with potential avenues for addressing community vulnerability and building local capacity.

Haiti is a case where a sudden disaster caused immense destruction on top of large, systemic problems which had not been addressed in an effective, or meaningful way. Paul Farmer calls this an ‘acute on chronic condition’\(^{32}\). This analogy is apt to continue to describe the recovery efforts in Haiti, and the lack of effectiveness in implementing new policy initiatives which would help to solve some of the systemic issues in the country. However, this is not solely the responsibility of the Haitian government. The international community has also played a role in supporting the systemic inequities in Haiti and should assist in helping the Haitian government to create effective recovering and build relevant capacity within the state to deal with potential disaster in the future.

By contrast, the Northridge earthquake serves as an example of how the capacity of a community or state to deal with a potential disaster can help to mitigate the vulnerabilities of its population. The reactions by local, state, and federal officials in responding to the disaster shows the importance of a well thought out emergency management plan and how useful it can be in mitigating the effects of a disaster on a population. Through the actions of FEMA, HUD, and other organizations LA County was largely able to manage the damage and destruction, house their displaced populations, and communicate necessary information to the people affected in the disaster area. In doing so, this largely helped to provide for an effective recovery process.

In the same vein, San Diego County largely has the capacity available to deal with a major disaster. However, certain segments of the population are still likely to be more affected than others. Here, at the systemic level, is where effective policy should be concentrated. Poverty levels are a key signifier of a population’s capacity for handling a major disaster, and make them more vulnerable in the event that a disaster does occur. Effective policy targeting poverty levels, health care access, and other areas in San Diego County will further improve the regions ability to withstand a disaster event, and provide the necessary capacity to recover effectively.

Disasters are unpredictable and their type unknowable until they strike in a given area. This makes planning efforts difficult, but not unmanageable. Planning for disasters to occur is a positive step in increasing the capacity of a region to handle the effects presented by a disaster event. As Haiti proves, the worst can occur at any time, and having an effective plan in place can help the response and recovery efforts immensely. Still, addressing vulnerability must be the priority when it comes to disaster preparedness.

\(^{32}\) See Farmer, 2012.
Vulnerability increases a population’s risk to the effects of a major disaster. By treating these ‘chronic’ symptoms the ‘acute’ actions of a disaster will have a mitigated impact on the populations. Disaster planning efforts should be conducted whenever possible, and policy solutions should seek to treat these underlying systemic issues. While policy changes are typically driven after an event has occurred, improvements should still be sought out as potential areas for improvement are discovered.

California responded with numerous policy improvements following the Northridge earthquake, and efforts for change in Haiti are still underway, but it is only through the execution of effective policy and planning efforts that government can help to reduce the vulnerability, and increase the capacity of communities likely to be impacted by a major disaster.

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Figure 1, Source: Ministry of Public Health and Population (MSPP)
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<th>Southern California</th>
<th>Los Angeles County</th>
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<td><strong>Density of workers per sq. mi.</strong></td>
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*Figure 2: Sources: 1990 US Census projections for 1994.*

*Figure 3*
Figure 4