Assessing Barriers and Facilitators Associated with Hazard Mitigation Planning with Considerations for Climate Changes for Massachusetts Coastal Communities

An Interactive Qualifying Project Report

To be submitted to the Faculty

Of

WORCESTER POLYTECHNIC INSTITUTE

In partial fulfillment of the requirements for the

Degree of Bachelor of Science

By

_____

Nicholas Corso

_____

Sabrina Holzknecht

_____

Cindy Lin

Date: March 12, 2012

Approved:

_____

Seth Tuler, Advisor

Executive Summary

Climate change has become a problem that can no longer be ignored. This kind of change is caused by a natural variability, a large event that shifts weather patterns, and as a result of human activity. Climate change is a global problem that causes shifts in weather patterns, temperatures, and atmospherics pressures in an area. Over the past few decades, disasters such as droughts, tornadoes, hurricanes, and heat waves have increased in both intensity and frequency. Shifts in an area's normal climate are the causes of these harmful changes. This increase in natural hazards affects human infrastructure and economics as well as cause injury and death in communities.

In coastal communities such as those of Massachusetts, natural hazards and climate change can have a drastic impact. These communities have been seeing an increase in sea level rise, flooding, and coastal erosion that are harmful to residents and industry. In order to encourage these communities to prepare for these events, the Disaster Mitigation Act of 2000 was implemented by the federal government. This act encourages communities to create hazard mitigation plans to help them prepare for potential hazards. Both the Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA) encourage the coastal communities to do this by providing them with grant and funding rewards that can help them protect their towns if they complete and approve this plan. FEMA and MEMA are also interested in having communities incorporate long term plans to mitigate climate change within the already existing hazard mitigation plans.

These agencies provide resources and examples of how to draft a hazard mitigation plan for communities. FEMA and MEMA set certain requirements that must be met in these plans that include hazard protocols during and after hazards, as well as pre-disaster plans which take precautions to limit the amount of damage that can be done. These plans are made by committees of town officials, such as the town planner, emergency management director, water and sewage director, and others. In order to create a plan, FEMA and MEMA suggest that communities first organize their resources, determine where their community is most at risk, then create the plan, and find the best methods for countering those risks with the resources available to them.

This process is not easy for many communities though. They face many problems stemming from a lack of time, personnel, resources, public support, funding, knowledge, and

even conflicting agency policies that they have to work around. As a result of these barriers, sometimes the plans are not created as effectively or timely as they could be. However, we also found that when a community has a unique facilitator, such as a champion to push the plan, a good economic standing, or good relationships with outside organizations, in any of these areas it is a great help for creating a plan.

The goals of this project were to identify the barriers and facilitators associated with creating a hazard mitigation plan as well as to identify the factors that promote considerations of climate change impacts into hazard mitigation plans. This study was conducted in three Massachusetts communities, Salisbury, Marblehead, and Westport. We accomplished these goals by:

- Selecting three Massachusetts coastal communities that demonstrated varying levels of hazard mitigation plan completion.

- Familiarizing ourselves with the current status of hazard mitigation planning in each selected case study.

- Conducting interviews with town officials involved in the hazard mitigation planning process in each selected community.

- Identifying the barriers and facilitators to creating hazard mitigation plans with considerations for climate change in these case studies through analysis of the interviews.

We selected the towns of Salisbury, Marblehead, and Westport because they each had different industries, incomes, and were at different points in the planning process. Salisbury had completed a plan in 2008 and had the lowest income with summer tourism as a primary industry. Marblehead had an expired plan from 2005 and was looking to hire consultants to begin a new plan. They had the highest income and were considered a resort community. Westport did not have a federally approved plan but were currently in the process of creating one in-house. They had a mid-range income and their primary industry was farming. For Salisbury and Marblehead we familiarized ourselves with their past plans before and during the interviewing process.

For each town we contacted four or five potential interviewees who were part of the hazard mitigation planning committee. We used the grounded theory approach to conduct our interviews, which involves not forming a hypothesis beforehand and instead analyzing the data

first and forming conclusions just from that. By using this method, we were able to conduct our interviews without the intention to steer the interviewees toward any one area we thought could be problematic, instead having them tell us what they found to be barriers.

In order to identify the barriers, we first extracted and labeled quotes from our interviews accordingly with the associated barriers or facilitators. Through our interviews, we noticed that these communities did not explicitly incorporate a climate change section into their plans. This was because they had many problems in just creating the plan and did not have time and resources to add in something extra and not urgent. The barriers and facilitators we found in the creation of the plan were separated into the groups:

- Access to experience and knowledge
- Available funding
- Resources and time
- Perceived importance
- Coordination and communication
- Climate change.

For access to experience and knowledge, we found that staff information, public knowledge, and outside expertise were the most important factors. Not having information available for staff and public use can slow down the planning process or even make some proposals less effective than they could be. In the same way, if the staff is not experienced with the planning process, creation of a hazard mitigation plan can become significantly more difficult and time consuming. This can be remedied by access for communities to a database with all the studies and resources available to them, experienced members and consultants available to work on the plan, or direct communication with MEMA and FEMA staff members who are willing to work with committees.

Access to funding was also very important for communities. Many of the communities do not have enough funding in their towns to hire consultants or obtain other resources to help with the planning process. Grant funding is one way in which these communities are able to receive money. However, grants can be competitive and the communities may not know they exist nor have the time to apply for one. An easy to access database that listed the grants and their requirements may help to educate the communities on their options. It is also beneficial for

communities to create strong relationships with outside organizations that share the same interests and can provide them with funds for projects or planning.

Having a staff and resources that are readily available is necessary for creating a plan. For many who work on the plan, it is not their only responsibility, and so they must prioritize and make time for the hazard mitigation plan. Since the staff on the committee is relatively small to begin with, this can be a problem. Hiring additional staff to work solely on the plan is not a good alternative as the plan is only updated every few years. Individuals on the staff who act as champions for the plan will keep the others working on the plan so that it can be completed and given the attention it needs. However, many towns do not have such champions. In these cases outside consultants can provide this drive since their jobs is solely to help on the plans. If MEMA and FEMA could help provide affordable consultants to communities, the planning process could be much smoother.

The hazard mitigation plans in general are not seen as a high priority for many town officials. Since these plans have such a long timeline and there is no specific time that the communities should expect the next storm, neither the public nor the staff view the planning process as urgent. As a result, many hazards are not addressed until after they have already damaged the town. In their own way, these hazards can themselves facilitate the creation of hazard mitigation plans since they encourage the town to plan ahead for the next one. However, educating the staff or citizens would be a safer way to encourage this. If MEMA or the community can raise awareness of the potential risks associated with not having a plan before a disaster then they may be able to motivate them to raise the hazard mitigation plan as a priority.

Having strong communication with outside agencies and between internal departments is very helpful for creation of this plan. If the committee members disagree on topics to be included, it can cause a standstill in the planning process and increase its difficulty. However, even though our literature review marked this as a common problem, our case studies' committees all worked well together and therefore, did not have this problem. We did find that connections to outside agencies like FEMA, MEMA, MasDEP or the Army Corp of Engineers were very useful to those working on the plan. If the communities have good relationships and reputations with these agencies, then it is much easier for them to get funding from them or receive their help in creating proposals and obtaining studies. Therefore, it can very useful for

communities to find organizations that share their interests and keep up good communications, even when they do not currently need their help.

Incorporating climate change was one of the hardest things for communities to do in their hazard mitigation plan. Even though it is something that FEMA and MEMA would like to see in plans, climate change considerations are not required for the plan. There are many other requirements for the plan, and so communities tend to focus on those and leave out sections that are seemingly optional. Climate change is also a widely debated topic that is not considered an issue by all, so it can be problematic to try to incorporate it into something of this magnitude. However, if MEMA were to make these considerations a requirement for hazard mitigation plan approval, then the communities would be more inclined and required to consider this issue and do what they needed to in order to plan for it.

Being able to understand and face these barriers will greatly benefit communities and hopefully allow them to create a hazard mitigation plan quickly and more efficiently. If the hazard mitigation planning process becomes less of a challenge for communities, they may also be more inclined to take the time to at least consider how climate change is affecting them and what can be done about it.

Abstract

Our project's purpose was to identify the barriers associated with creating a hazard mitigation plan with considerations for climate change, specifically for Massachusetts coastal communities. The scope included research interviews conducted with knowledgeable officials in three towns, Salisbury, Marblehead, and Westport. We determined that the most important factors to including a climate change section were experience and knowledge among planners, properly prioritized funds, staff availability, individual's perceptions on given issues, and proper coordination and communication between all parties.

Table of Contents

List of Figures

List of Tables

1. Introduction

Climate change has been affecting weather and contributing to the increase in magnitude and frequency of climate related disasters within the past few decades according to scientists (Douglas, 2004, p.203; Frumhoff, 2007, p. 419; Burroughs, 2001, p.136; McKibben, 2009, p. 34). These disasters include droughts, tornadoes, hurricanes, and heat waves, causing significant impacts like sea level rise, flooding, and coastal erosion (Burroughs, 2001, p. ix). These disasters and their impacts cause injury and death as well as significant damage to infrastructure. For example, buildings can be damaged by flooding or other disasters, while temperature and humidity changes easily affect aspects of a community's culture, like recreational patterns and health (IPCC, 2007).

In Massachusetts, coastal communities are vulnerable to many hazards, such as hurricanes, coastal erosion, and sea level rise. During the Mother's Day Storm of 2006, an extreme weather event in the New England area, Massachusetts required $70 million of aid from state and federal agencies within the first four months of the event (Douglas, 2004, p. 215). As the frequency of storms and other extreme weather events increase, the impacts, and subsequently costs resulting from damage to infrastructure and human life will only be amplified by climate change. It is expected that there will be a loss of one meter of coast for every centimeter in sea level rise (Day, 2004, p.24). In some places, the rate of erosion is significantly higher, such as the south shore of Martha's Vineyard which loses 1.7 meters per year (Broulliette, 2008, p.351). There are also increases in the frequency of coastal storms. It is estimated that urban locations are in more danger of these storms due to their high density populations (Leichenko, 2010). One study of Boston warns of the potential destruction the city faces in the coming years due to increased storm strength and flooding (Kirshen, 2008).

In order to encourage coastal communities to prepare for natural hazards, the federal government has enacted legislation encouraging the implementation of hazard mitigation plans known as the Disaster Mitigation Act of 2000 (Public Law 106-390). The Massachusetts state government has created a state hazard mitigation plan, which encourages municipalities to draft their own customized mitigation plans that address local hazards and disaster risks. It does this by increasing awareness about the safety and the cost benefits of hazard mitigation plans, as well

as providing resources and examples on how to draft disaster mitigation plans (Commonwealth of Massachusetts, 2010).

Many communities have succeeded at creating hazard mitigation plans, and some have included considerations for climate change. The Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA) are now also encouraging communities to include a section in their hazard mitigation plan that considers climate change adaption and ultimately creates long term solutions. Communities create these plans with input from the public, effectively utilizing time and resources, and other planning methods while still taking into consideration the requirements set by FEMA and their fiscal limitations. Despite FEMA and MEMA guidance, there are communities that still have significant difficulties creating their hazard mitigation plans. In some situations, communities that have created their hazard mitigation plan do not include the potential effects of climate change due to even further difficulties. Studies have suggested that a variety of barriers ranging from social, economic, institutional, and individual perception are the causes of these difficulties (NOAA, 2010; Bond, 2009; Hallegatte, 2010; Reddy, 2000; Schneider, 2002).

These barriers, which prevent Massachusetts coastal communities from creating hazard mitigation plans and including climate change within those plans, need to be more carefully understood. Currently, there is little information regarding such a specific geographic area and most studies are generalizations of problems that are experienced. The causes for the barriers' existence must be understood in order for them to be overcome. Those factors that assist in the inclusion of climate change adaptation planning, or what we call "facilitators," also need to be better understood in order to achieve the successful completion of plans.

The goals of our project were twofold: 1) to identify the barriers to creating hazard mitigation plans and 2) to identify the factors that promote consideration of climate change impacts in hazard mitigation plans. We investigated various coastal communities in Massachusetts to identify which would be the best to study in order to understand these barriers and facilitators. Some considerations for which towns to study included their current status and contents of their hazard mitigation plans, local economies, and level of exposure to hazards. We then contacted and conducted interviews with local officials, delving into the nature of their difficulties and successes. The interviews served to establish the perspectives of those involved in the planning process in order to understand their interests and concerns regarding these plans

in terms of the community. Through this process, we were able to identify these barriers and facilitators. The main barriers related to a lack of staff manpower, motivation, and interest to dedicate to hazard mitigation plan. The most helpful facilitators included grant funding for planning and a champion willing to push until the plan is created.

2. Background

A successful hazard mitigation plan is one that minimizes economic, infrastructure, and human losses causes by natural hazards. Unfortunately, there are barriers that prevent planners from creating the most successful plans that include considerations for climate change. On the other hand, certain cases are facilitators: factors that help advance the planning process. In order to study these factors, we must first know something about the situation at hand. The first section of this chapter will discuss climate change and its causes, moving into the hazards associated with the Massachusetts coast in the second section, delving into how plans are created to respond to general hazards in the third section, and finishing by discussing potential barriers and facilitators to the plan in the fourth section.

2.1 Climate Change

Climate change, in a simple definition, is a significant and lasting change caused by either natural variability or as a result of human activity that affects weather patterns, temperature, atmospheric pressures and other factors associated with an area's climate (Parry, 2007). This change can be regional or global and can take ten years or a hundred to fully manifest. This phenomenon is global and can cause unexpected and drastic effects that would not be in the public's best interest to ignore. In the following sections, we will discuss what causes climate change and its effects.

2.1.1 Causes of Climate Change

The earth's climate is composed of a variety of cycles, from the ocean currents to the concentration of gases in the air, that all relate back to one another. When there is a change in one cycle, all of the others are affected by it. Fluctuations in these cycles within the natural system coupled with the effects caused by human activity have all contributed to recent changes in the global climate.

The Earth's temporal climate is intimately linked to its biological systems. The fluctuations of atmospheric components, such as carbon dioxide and nitrogen, are dependent on the interactions between these gases and living material as part of the natural cycle. The concentration of atmospheric components is a critical factor in defining the climate. This is because the concentration of different gasses in the atmosphere can change how it accepts the solar radiation that heats the earth. For instance, when organic materials collect underground and

form coal and oil, the levels of gases like CO_2 in the atmosphere are depleted (Burroughs, p.85-86). Examples of these fluctuations can be seen over Earth's long history. The high carbon dioxide levels of the prehistoric Earth, which were essential in maintaining that climate, have decreased significantly since the Cretaceous period (Burroughs, p.225). During this period it is estimated that carbon dioxide levels were "four to ten times current levels," the decrease of which has had a general cooling effect on the climate, making it much more suitable for today's human life (Burroughs, p.85-86).

The fluctuation of atmospheric gases has been altered and influenced by both human and natural factors. The most common of these influences is the release of extra carbon dioxide emissions into the atmosphere. It is "more than 90 percent certain" that these carbon dioxide emissions have caused "the most observed increase in global average temperature since the mid-20th century" (IPCC "Summary", 2007, p.10). Increased amounts of carbon dioxide, is typically associated with use of fossil fuels and use of built infrastructure. Rises in other emissions, such as methane and nitrous oxide, are attributed to agriculture. The orbital variation of the earth and changes in the intensity from the sun both contribute to the additional release of carbon dioxide into the atmosphere. However, these are only minor fluctuations that take centuries to be fully realized (Florides, 2009, p. 394).The rise of these gases cause a general heating of the atmosphere, which increases the rate at which ice caps melt, altering ocean currents and raising sea levels (Farber, 2007). This trend is illustrated in Figure 1.
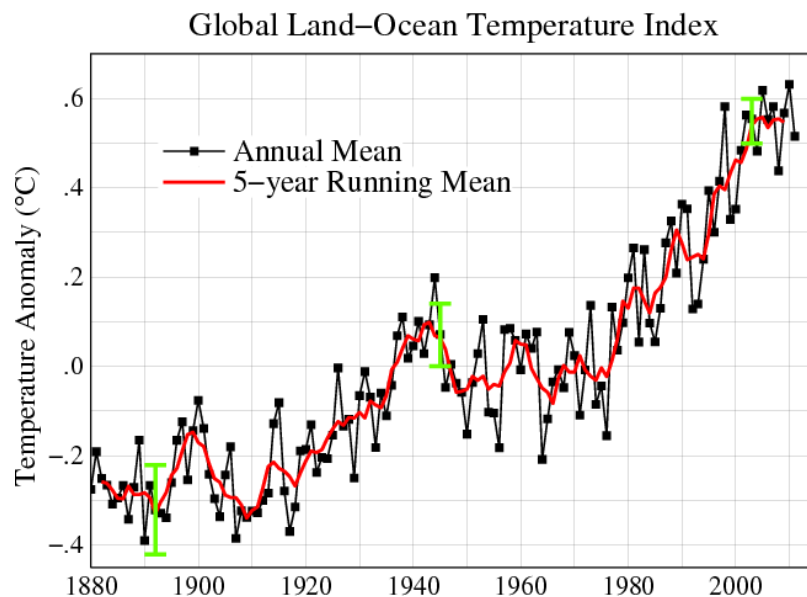
Figure 1 – Mean Yearly Global Surface Temperature in Relation to Temperature in Years 1951-80, From 1880 to 2006, From (Hansen et. al, 2006)

Ocean currents play a big part in climate regulation by transporting energy to higher latitudes; this allows varieties of climate types to exist without any of them becoming too extreme (Burroughs, 2001, p.207). Since the currents play a big part in regulating climate, any major change in the patterns of these currents can affect the climate, causing simple temperature change or a complete shift in the climate type of an area (Burroughs, p. 207). The rise in atmospheric temperatures has resulted in melting ice sheets, which then collapse into the ocean. This significant increase in water volume and water temperature has resulted in changing ocean currents (Burroughs, p.207, 217).

2.1.2 Impacts of Climate Change

When variations in factors that regulate climate occur, many natural hazards can increase in frequency and severity, in turn having social, economic, and institutional consequences. In the following sections, we will discuss the impacts on weather, temperature, and sea level and how those affect the greater human community.
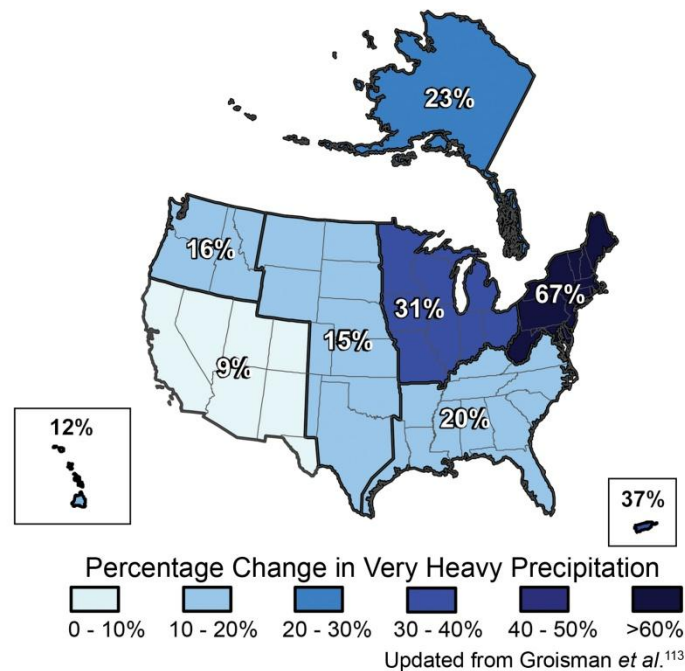
The map shows the percentage increases in very heavy precipitation (defined as the heaviest 1 percent of all events) from 1958 to 2007 for each region. There are clear trends toward more very heavy precipitation for the nation as a whole, and particularly in the Northeast and Midwest.

Figure 2-The Percent Increase in Heavy Precipitation in the US (United States Global Change Research Program, 2007).

2.1.2.1 Weather Related Impacts

Climate is related to the long term trends of the weather for a given area, whereas weather is the collection of specific events that occur in the natural environment ("Weather", 2012). As a result of the changing climate, weather related events like hurricanes, tropical storms, and tornados have increased in frequency in recent recorded history. The intensity of weather related hazards, including mere rainfall has increased, as seen in Figure 2. The Pentagon released a report in 2003 forecasting "violent storms across Europe, megadroughts across the Southwest United States and Mexico, and unpredictable monsoons causing food shortages in China" (IPCC, 2007). It costs the United States billions of dollars every year to respond to hazards like these. As the severity of these hazards increase, it becomes more costly to repair and recover following each weather related catastrophe (Apportioning, 2007).

2.1.2.2 Temperature Impacts

Temperature changes in the global climate can be seen in the atmosphere and in the oceans. These changes have been severe enough that in 2007, enough ice melted in the Arctic Ocean to open up both the Northeastern and the Northwestern passages around the Arctic. This kind of melting was not predicted to happen until the late 21st century (McKibben, 2009). Due to this rapid melting, the sea level will begin to rise. This can pose a large threat to coastal communities, as we will discuss in the section 2.2.

Besides raising the sea level, climate change can have a serious effect on the biological world. The Intergovernmental Panel on Climate Change (IPCC) found evidence that recent temperature increases have had negative effects on physical and biological systems, and human health (IPCC, 2007). As a result of the different physiology of certain plants and animals, changes in temperature can affect whole ecosystems and impact what types of biological species can reside there. For example, plankton is an organism that has different forms, each of which lives in different climate conditions. In fact, by studying these organisms, one can determine the changes in an area's temperature over millions of years (Burroughs, 2001, p.75).

2.1.2.3 Sea Level Rise

Sea level rise is a serious concern associated with climate change. Besides the contribution from melting ice caps, water experiences thermal expansion when heated, and so the volume of the same amount of water is increased. Seawater absorbs more than 80% of the heat

that is added to the climate system, which causes the overall temperature of the oceans to rise in depths of up to 3000 meters (Farber, 2007). Rising sea levels "result in loss of coastal lands, inundation of some estuary systems with salt water, salt water intrusions into some drinking sources, and increased exposure to flood damage" (Farber, 2007). Coastal communities are directly affected by hazards like erosion and sea level rise. These impacts can be devastating because over half of the United States population lives in a coastal area (NOAA, 2011). Since this is such a major percentage of the overall U.S. population, there are major potential consequences of sea level rise that can cause a large amount of destruction and loss (Davidson, 1999).

2.2 Massachusetts Coastal Hazards

Coastal communities of Massachusetts have experienced their share of natural hazards and weather related disasters and have been able to survive them in the past. Unfortunately, as climate change becomes a more significant issue, the hazards have grown more frequent and dangerous, and their consequences are more severe. Good planning is necessary to mitigate their destructive impacts (MEMA, 2010, p.13). Natural hazards cause problems that include large material losses, destruction of essential infrastructure, and the deterioration of public health services, all culminating in significant economic costs for the federal and state governments (Douglas, 2011, p. 203). For instance, Hurricane Bob swept through New England in August of 1991, causing damage to the entire Commonwealth. It caused erosion on Cape Cod, flooding along the coast, 8 deaths, and $1.5 billion dollars spent on recovery efforts (Ashton, 2008, p.729; Henson, 1995, p.12). Among the coastal hazards of most concern in the state are nor'easters, hurricanes, flooding, and erosion. These hazards can have a sequential relationship. For example, storms cause flooding, which in turn causes an increased rate of erosion. Erosion can also occur from routine tidal forces.

2.2.1 Nor'easters and Hurricanes

Nor'easters are powerful storms characterized by their strong northeastern winds. They typically occur during the winter and create surges on the coast equal to minor or near miss hurricanes (Ashton, 2008, p.723). The impacts of these storms can include massive damage to property due to strong winds, especially along the coast (Douglas, 2011, p. 215). As climate change becomes more apparent, the frequency of these storms has become more apparent as well (Douglas, 2011, p. 216). In a study that linked global emissions of carbon dioxide to this increase

in nor'easter storm frequency, scenarios were created to determine the future likelihood of these storms. Storms such as a 100-year storm, characterized by its stronger winds, greater amounts of rainfall, and general power of destruction, are also increasing in frequency (Kirshen, 2008, p. 438). Even if the level of emissions is reduced from its current level, the likelihood of a 100-year storm, one whose probability to occur is one in every 100 years, in Boston has been reduced to occurring every15 years instead of 100 . If these emissions are heighten, the likelihood of this kind of storm occurring reduces to once every 5 years (Kirshen, 2008, p. 446).

Hurricanes have also become a significant issue for the people of the Northeast (Henson, 2010, p.12). Already, hurricanes have exposed parts of the northeast that are vulnerable to intense and destructive weather (Ashton, 2008, p.723). Three threats caused by hurricanes are coastal inundation caused by storm surges, increased flooding, and widespread wind damage inland ('July', 2007). Massachusetts has the unfortunate position of being susceptible to each of these hurricane threats due to its size and location ('July', 2007). It is expected that the frequency and intensity of hurricanes will increase in the northeast with the increasing variability in annual weather trends and increased sea-surface temperature resulting from climate change (Ashton, 2008, p.723).

Not only are communities visited by these terribly destructive storms, but they also expect higher amounts of general rainfall a year, especially in the eastern Massachusetts area (Douglas, 2011, p.210). The American Society of Civil Engineers has studied the maximum annual rainfall and determined that Massachusetts and New Hampshire have been experiencing a higher magnitude of extreme precipitation since 1970 (Douglas, 2011, p.210). Towns and their residents used to be mainly concerned with just the larger scale events. In light of these data, they must also consider if their infrastructure is capable of handling increasing water loads from the growing volume of regular rainfall.

2.2.2 Flooding
A rise in sea level coupled with bigger storms, will make flooding a bigger problem. A study published by Mitigation and Adaptation Strategies for Global Change was published in 2007 that studied flood levels in the Northeast stretching from New Jersey to Massachusetts (Ashton, 2007, p. 719). It focused on the likelihood of flooding due to stronger storms. The conclusion was that flooding was inevitable, especially in coastal areas due to their proximity to the sea and the "increase baseline [sea] levels and the possible increase in storm frequency"

(Ashton, 2007, p.736). The study found that there will be greater flooding in many areas of Massachusetts, especially upriver of the Charles River Dam (Kirshen 2008, p. 445). With the expected rise in sea-level globally, the study estimated that most of Metropolitan Boston will be underwater by 2100 including Logan International Airport, as seen in Figure 3 (Kirshen, 2008 p.447).

a 2005 Baseline Stillwater Elevation 3.0 (+/- 0.2) meters NAVD

b 2100 A1fi hi Stillwater Elevation 4.2 (+/- 0.2) meters NAVD

Areas of Innundation (Estimated)

1   0.5   0   1 Kilometers

Town Boundaries

Federal Emergency Management Agency 100-Year Flood Boundaries

Federal Emergency Management Agency 500-Year Flood Boundaries
Source: MassGIS (Background Orthophoto dated April 2005)

N
W   E
S

Figure 3-Current and projected sea levels for 2100 in relation to Metropolitan Boston for high emission scenarios.

A rise in rainfall will put a heavy burden on storm water systems. Towns have existing drainage systems, but they may prove deficient if they are not updated to deal with growing volumes of water, leading to significant economic costs. The Heinz Center estimates that the costs from flooding are equal to or exceed those of coastal erosion, amounting to at least $3.5

billion to $5 billion annually (Ashton, 2008 p.723). During the Mother's Day Storm, which occurred from May 12th through the 16th of 2006, an estimated 8 to 14 inches of rain fell on the northern coast of Massachusetts, most in the first 24 hours. Parts of Massachusetts were declared a federal disaster area, resulting in over $70 million of federal assistance given to the state over a four month period. The storm was known to be more destructive than a one-hundred year storm (Douglas, 2010). As storms continue to batter the coast, destruction like this may become the norm in many areas.

2.2.3 Erosion

Coastal erosion is an emerging hazard for all maritime communities, caused by the combined effects of the storms, flooding, and sea level rise. Erosion occurs when waves approach the coast and take parts of the land with it (Brouillette, p.10). Storms create waves with more force, which increases the rate of erosion. When the sea level rises, there is more water that can come into contact with the coast to wear it away. Is it estimated that with every rise of a centimeter of the sea-level, there will be a resulting loss of about a meter of coast (Day, 2004, p.24). In 2004, the mean global increase in sea level was at 0.15 to 0.20 centimeters per year (Day, 2004, p.24).

Increasingly powerful storms also cause a higher rate of erosion. Winds from storms can pull sediments that are found underwater away from the land while storm runoff can pull even more sediments and particles from the land into the ocean (Butman, 2008, p.1231). Increased precipitation and flooding are additional factors, resulting in overland runoff and groundwater seepage which causes erosion (Brouillette, 2008, p. 44; Kirshen, 2008, p. 447).

The make-up of the beaches on the eastern coast of the United States cause even more concern due to relatively small sand grain size. The coasts that are more susceptible to erosion are those with smaller particles that can be more easily carried away (Day, 2004, p.25). These include particularly sandy beaches like those of the Massachusetts coast line (Day, 2004, p.25). The areas that the US Geological Service has estimated to be the most vulnerable to erosion are Southern New England, including all of Cape Cod, Nantucket Island, and Martha's Vineyard (Brioulette, p. 11)

Erosion, generally, poses a problem for an area due to the high volume of development located near the coast and the existence of current erosion in places like the Boston Harbor Islands (Himmelstoss, 2006, p.1230). The Heinz Center estimates that coastal erosion costs $3.5

billion to $5.5 billion per year nationwide, which accounts for things like depreciating infrastructure that must be maintained and investments in temporary or permanent shoreline protection (Ashton, 2008, p.723). It is also estimated that 1,500 homes are lost to erosion every year (Ashton, 2008, p.722). Eleven percent of the Massachusetts coast was considered "seriously eroding" in 1997 (Brouillette, p.11). Currently, the Massachusetts Coastal Zone Management suggests that 60% to 70% of the coast is in danger of being eroded away (Brouillette, p.11). That increase will only cause a higher rate of homes and infrastructure to be lost and families and businesses that will need to be relocated.

2.3 Mitigation Planning

In order to counter these various threats to health and well-being, the Massachusetts legislature as well as the Federal Emergency Management Agency has encouraged the creation of hazard mitigation plans. The plans' main purpose is to provide a course of action for Massachusetts municipalities to follow not only during and following the occurrence of a disaster, but prior to it as well. The planning process forces town planners, officials, and residents to consider towns' vulnerabilities and resources in order to identify what are the potential paths to mitigating the effects of hazards. This is accomplished by planning for hazards and improving existing infrastructure to ensure that they will not be heavily damaged by storms. In the following sections, we will discuss the regulations surrounding the plans and the process as dictated by the Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA) and then move onto FEMA suggested method for creating a plan.

2.3.1 FEMA and MEMA Regulations

Both MEMA and FEMA strongly encourage the use of hazard mitigation plans. According to FEMA, a hazard mitigation plan is "sustained action taken to reduce or eliminate long-term risk to people and their property from hazards" (2010). In accordance to the Disaster Mitigation Act of 2000 (Public Law 106-390), state, local, and tribal governments are encouraged to develop a hazard mitigation plan in order to be eligible to receive certain types of (non-emergency) disaster and rebuilding assistance. Participating communities are required to resubmit the plan, including any updates, for approval every five years (FEMA, 2008, p. 10).

FEMA does not have specific requirements for the process needed to create a plan, but rather it has enacted guidelines for what considerations a plan should include as well as actions

the community must engage in during the process. In addition, the Federal Government makes recommendations on how the planning process should proceed (FEMA, 2008). Unfortunately as these are only recommendations, not all towns follow them. Both the guidelines for the plan and for the process to create the plan are described in the following sections. Recommendations are optional because the planning process can vary greatly from town to town. Every town is a unique entity, has its own combination of natural hazards and residents, and differences in local government structure.

2.3.2 Suggested Method to Create a Plan

FEMA suggests four basic steps to creating a successful mitigation plan: organizing resources, assessing risks, developing a mitigation plan, and implementing and monitoring the plan, as seen in Figure 4.

Figure 4-FEMA (2010)

Step 1: Organize Resources

In the first step, a community will set up a hazard mitigation committee of local officials to facilitate the planning process (FEMA, 2010; Saugus, 2011, p. 3). These are usually representatives from all the major departments within a town including the planning office, water and sewer, fire, conversation commission, and more. The community can also usually receive grant money from the state or federal government in order to bring in planning experts or consultants (Saugus, 2011, p.5).

As part of the first step, a town will also identify the resources that must be considered in a plan. Resources refer to infrastructure, assets, and other important aspects of the town. Then, they will begin creating a hazard mitigation plan by making an inventory of the resources

available for the plan. For example, the Town of Hampden, MA inventoried "critical facilities," those resources or structures that are considered important for the wellbeing of the town. These include fire and police stations, emergency shelters, evacuation routes, and power supplies (Hampden, 2008, p. 28).

The public can be an important tool for the committee to use. Including the public in the hazard mitigation planning process is necessary to comply with federal guidelines. In order to meet these requirements, a town can hold open meetings several times in the planning process so that citizens can review the hazard plans and become educated on the issues at hand (Godschalk, 2010, p. 733). However, a much better method is to involve the public more closely in the planning process from the beginning (Burby, 2001). This way, locals can be used as a knowledge base in order to immediately take into account their opinions. Their opinions are important because they can give a different perspective for officials that have not been encountered. They can also give alternative suggestions that might be more feasible and that officials have not considered. Towns that take the time to learn about public preference and to educate the local populace are more likely to have full and comprehensive hazard mitigation plans (Burby, 2001).

Sometimes, towns have difficulty convincing citizens to consider hazard mitigation planning. Natural disasters can be infrequent and relatively unpredictable. In some cases, it is possible that some people may not see how directly hazards can relate to them. The common exception to this case is when a town has had a recent experience with disaster or is undergoing large scale development (Godschalk, 2001; Rigden, 2007). Even when people make the connection between natural hazards and their wellbeing, the complexity of the situation leads them to believe that the entire problem is best dealt with by experts and the government (Godschalk, 2010, p.735).While there is some truth to this mentality, some amount of public involvement is needed. When the public is well educated in the subject, the citizens can put the appropriate pressure on officials to create an effective and comprehensive hazard mitigation plan (Godschalk, 2010, p.738).

Step 2: Risk Assessment

Next in the process, the committee performs a risk assessment for the town. A risk assessment takes into account how likely an area is to be affected by a given hazard. This takes into account historical disasters and projected data based on past frequency. It may also include

information about predictions based on climate change or likelihood of erosion (FEMA, 2008, p. 29). They then proceeded by conducting an analysis of natural and manmade hazards to determine their quality and likely durability during a hazard. (Hampden, 2008, p. 34-84). It is important that communities consider their most likely hazards, resources, and critical facilities in order to create a plan that protect essential facilities for the specific types of hazard (Hampden, 2008, p. 34-84). Frequently there will be mention of the "hundred year storm," a term described in a previous section. Storms such as these have the probability to occur once every 100 years, though they can occur at any time. There is also no guarantee they will only happen once every hundred years.

While risk assessment judges the likelihood of a disaster event taking place, a vulnerability assessment determines what sort of damage it would create, given a specific scenario (FEMA, 2008, p. 36). This is useful because it allows planners to figure out what areas deserve the most focus and resources in the plan, as well as allowing a quantifiable value of savings to be put on a hazard plan. A vulnerability assessment takes into consideration both social and economic vulnerability, difficultly to recover from more than the monetary damages. For instance, it might take longer for a low income neighborhood to recover from a disaster, or a town might struggle if the hospital or school were incapacitated (FEMA, 2008, p. 36-37). Using these gathered data, a town develops a plan.

Step 3: Develop a Mitigation Plan

A hazard mitigation plan consists of many parts but usually maintains the same structure from plan to plan. It begins with an introduction that describes the authority with which the planning committee derives their power from (Hampden, 2007, p. 1; Merrimack, 2008, p. iv). The plan may then go into details about how the plan was created and can include dates of public and/or committee meetings (Merrimack, 2008, p. 5). A chapter will then describe the regional or town profile, giving a sense of size with regards to population and area, as well as the housing and employment makeup. The plan will also elaborate on the current land use, the state of existing transportation infrastructure like roads, highways, and public transit systems, before delving into available natural resources (Merrimack, 2008, p. 12; Hampden, 2007, p. 4). The plan will list all the hazards that the area is likely to face followed by a list of the critical facilities and the risk and vulnerability assessments (Merrimack, 2008, p. 23, 52; Hampden, 2007, p. 11, 28). The next chapter will then present either existing or future mitigation strategies

(Merrimack, 2008, p. 171, 175; Hampden, 2007, p. 34. 86). Either in the previous chapter or as a separate chapter following, there will be a list of prioritized action items in an effort to enact mitigation strategies (Merrimack, 2008, p. 175; Hampden, 2007, p. 92). The plan will then conclude with the process on how the plan will be approved and implemented (Merrimack, 2008, p. 205, 207; Hampden, 2007, p. 95).

Step 4: Implement Plan and Monitor Progress

Once a plan is completed, it must then be submitted for approval by the town governance, MEMA, and FEMA. Approval by all three will allow the town to begin implementing their plans and make them eligible to qualify for future funding through the FEMA Hazard Mitigation Grant Program (MEMA, 2003, p.3). With this funding the town can begin to work on the mitigation action items they outlined in their plan.

Designing and building a structure that will help mitigate the effects of a hazard prior to the actual occurrence is an example of a mitigation action item. The Town of Dracut has built a new, higher flood barrier wall around their sewage lift station. This allows the station better protection from even the largest and typically uncommon floods. Before this plan was in place, the Town of Dracut was vulnerable to sewage back-up whenever floodwaters reached the top of the old flood wall. This could cause serious risk to public health, especially if the station was inoperable for extended periods of time. By mitigating the hazard ahead of time, the Town of Dracut has successfully prevented the health risks related to sewage back-up as well as damage to the lift station itself, both caused by cases of extreme flooding (MEMA, 2009, p. 2).

2.4 Barriers to Hazard Mitigation Planning

In the process of hazard mitigation planning, there are factors that present themselves and hinder the planning process from moving forward. These can be categorized as social, economic, institutional, and individual perception barriers and facilitators, which are associated with the creation of hazard mitigation plans as well as the inclusion of climate change. They reflect the different influences of the various parties including Federal, State, and local Governments, the planning organization, and the citizens of a community. The effect of many specific barriers is countered by the effect of a facilitator. Therefore, we also discuss what is known about factors that facilitate the process. In this section, we will review these social, economic, institutional, and individual perception barriers and facilitators. Examples of each category can be found in Table 1.

Table 1-Examples of some expected barriers and facilitators associated with creating a hazard mitigation plan with considerations for climate change.

Category	Examples		
Social	Public is ignorant of the issues surrounding hazard mitigation	Public is not concerned with hazard mitigation	Public is misinformed about the severity and impact of hazards
Economic	Lack of internal funding	Difficulty associated with obtaining outside funding	Competition among other communities for outside grant funding for projects
Institutional	Conflicting regulations and polices between state and local agencies	Bureaucracy of the state system confuses and slows down the communities	Lack of resources like time and personnel to create the plan
Individual Perception	Committee members do not perceive climate change to be an issue	Different perception of hazards among committee members creating varying levels of motivation	Members have varying levels of interest with regards to creating the plan

2.4.1 Social Barriers and Facilitators

Social barriers directly relate to the interactions and the relationships between the planning parties and the community members. These barriers can include public ignorance and a lack of public support. Ignorance of the issues and process is a significant barrier. Many citizens are unaware of the benefits of hazard planning and believe planning is unnecessary until hazards occur (NOAA, 2010, p. 10). Most citizens do not view adaptation planning as a tangible concern and therefore do not view it as a priority. To counteract this mentality, adaptation planning should be integrated into other plans that the public does find interesting in order to bring awareness and facilitate the creation of the plans (Bond, 2009, p. 216).

Public ignorance can cause a lack of public support. Public support is important to hazard mitigation planning, because it provides additional motivation for the planning committee to work on the plan and could also make it more of a priority, thus expediting the process (NOAA, 2010, p. 34). In situations dealing with coastal communities, observers have noted that citizens want to both further develop on the coast and protect it from damage (NOAA, 2010, p. 9). In terms of development, the cultural bias is to favor economic growth rather than public safety programs, like hazard mitigation (NOAA, 2010, p. 34; Glavovic et al., 2010, 692). When public support is high, the three steps needed to facilitate the planning process are the perception of natural hazards to be an issue followed by the push to find a solution, ultimately resulting in the

application of pressure to the government (NOAA, 2010, p.10). An example includes special interest groups that are concerned about climate change who push for governmental action and consequently enlighten the community (Bond, 2009, p. 219).

2.4.2 Economic Barriers and Facilitators

One of the most essential resources required to develop a hazard mitigation plan is funding. Funds are needed to support staff members tasked with developing a plan, conducting studies to understand the effect of hazards, hiring consultants with useful expertise, and ultimately implementing the plan (NOAA, 2010, p.8, 10). Unfortunately, adequate funding is simply not available to communities in many situations. Many times, the amount available to spend is entirely dependent on the wealth of the community as much of the funds are acquired through property taxes (NOAA, 2010, p.10). For specific needs, it is beneficial for communities to apply for grants from FEMA or MEMA in anticipation of a disaster or following one (FEMA, 2010). One study found that communities evaluate the cost of the plan and the benefits that plan will create, and some ultimately believe that ratio is too high and therefore not worth the resources needed to create the plan (Hallegatte, 2010, p.52).

In communities where residents have a large say in municipal spending, the priority may not be placed on mitigation planning since the plans give little individual benefit. Many community members are simply unaware of the larger benefit that hazard mitigation can provide (NOAA, 2010, p.34; Reddy, 2000, p.1). Thus, the size of immediate costs associated with planning to upgrade infrastructure coupled with the uncertain extent of the benefits is a major reason why some are hesitant to initiate any work (Hallegatte, 2010, p.69). In coastal communities, infrastructure that is planned and designed to mitigate hazards, such as seawalls, takes away personal benefits such as detracting from the attractiveness of a town, reducing tourism, and decreasing the marine wildlife populations, which reduces the profits of fishermen (Hallegatte, 2010, p. 70). Even in cases where it is apparent that benefits would justify costs, the funds may simply just not be available to finish the planning process (Hallegatte, 2010, p.70).

2.4.3 Institutional Barriers and Facilitators

Institutional barriers and facilitators are those that relate to the relationships and interactions between local, regional, and state governments and agencies. When communities attempt to create their plan the relationships and interactions with government agencies will contribute to the creation of the plan. Communities are welcome to approach FEMA and MEMA

whilst creating plans for funding and support in order to complete their plans (FEMA, 2008, p. 10). The ultimate goal is to obtain the approval of MEMA regarding communities' plans to be eligible for certain funding opportunities from FEMA and MEMA. That enticement facilitates the process by acting as a motivator. Other interactions between communities and government departments like the state highway department, environmental agencies and/or historical commissions can result in problems with jurisdiction (Schneider, 2002, p. 144). For example, Salisbury, Massachusetts is a coastal community whose beach is under the jurisdiction of the state, because it is a barrier beach. The town must go through a permitting process in order to make changes to the beach or the beach front area (Salisbury Beach, 2012). With such a variety of jurisdictions, communities must coordinate with agencies and departments to make a substantial amount of progress. In these situations, the planners must meet with the requirements of these organizations as well as those of FEMA and MEMA to be allowed to move forward on plans.

Relationships and interactions between members of the hazard mitigation planning committee can either help facilitate or hinder the planning process. The committee is composed of staff members or other town officials like a general planner, fire chief, or sewage and water manager. Some studies argue that having a wide range of officials on the committee is necessary to obtain a diverse viewpoint and a wider range of ideas (NOAA, 2010, p.8). In some situations while planning, conflicts can arise due to members' priorities, which can cause lengthy discussions that may not result in substantial conclusions (Schneider, 2002, p. 144). These conflicts can result with, officials preferring to respond to emergencies whenever they occur rather than conducting long term planning in order to avoid working with other committee members (Schneider, 2002, p. 143). However, this menagerie can also mean more disagreements about how to handle prioritizing amongst competing local issues (NOAA, 2010, p.8). Barriers can also arise with staff availability. In some cases, the requirements for a mitigation plan can be challenging for a town to meet as a result of a lack of personnel to handle the plan in a timely manner (Schneider, 2002, p. 144).

2.4.4 Individual Perception Barriers and Facilitators

While working in a group, there will inevitably be differing opinions. Differing opinions can have a negative impact when members of the group do not agree on priorities because they have different perceptions on the entire situation. This results from the various creators of the

plan working in the community within different realms (i.e. Planning, Emergency Management, Conservation, etc.), having different experiences, and simply being different people. Each person's individual perception can cause a lack of agreement that can harm the creation, the approval, and the execution of the plan.

In the case of including climate change, an extreme example would result from different members not agreeing on the existence of climate change. Some members would argue that it would be beneficial to include climate change because they perceive it to be a potential hazard. For those that do not perceive the existence of climate change, they may argue that it is not worth the time and effort to prepare for something that does not affect the community. This can ultimately lead to a stalemate in the creation of a plan or a substandard plan that does not include considerations for climate change.

2.5 Background Summary

This background chapter aims at illuminating the underlying factors that would assist in determining the barriers to including climate change to hazard mitigation plans. It is important to understand what sort of climate change is currently affecting the Massachusetts coast as well as the subsequent hazards. Understanding the process of how hazard mitigation plans are created is essential to points where barriers may arise. We preemptively identified barriers in order to recognize them and obtain a general sense of their nature prior our data collection. By understanding all of these different aspects of knowledge, one can gauge the necessity and the difficulties associated with hazard mitigation planning.

3. Research Methods

The goals of our project were twofold: 1) to identify the barriers to creating hazard mitigation plan and 2) to identify the factors that promote consideration of climate change impacts in hazard mitigation plans. To achieve our goals we:

- Selected three Massachusetts coastal communities that demonstrated varying levels of hazard mitigation plan completion.
- Familiarized ourselves with the current status of hazard mitigation planning in each case study.
- Conducted interviews with town officials involved in the hazard mitigation planning process in each selected community.
- Identified the barriers and facilitators to creating hazard mitigation plans with considerations for climate change in these case studies through analysis of the interviews.

In the following sections, we present our detailed plan to achieve the above outlined goals.
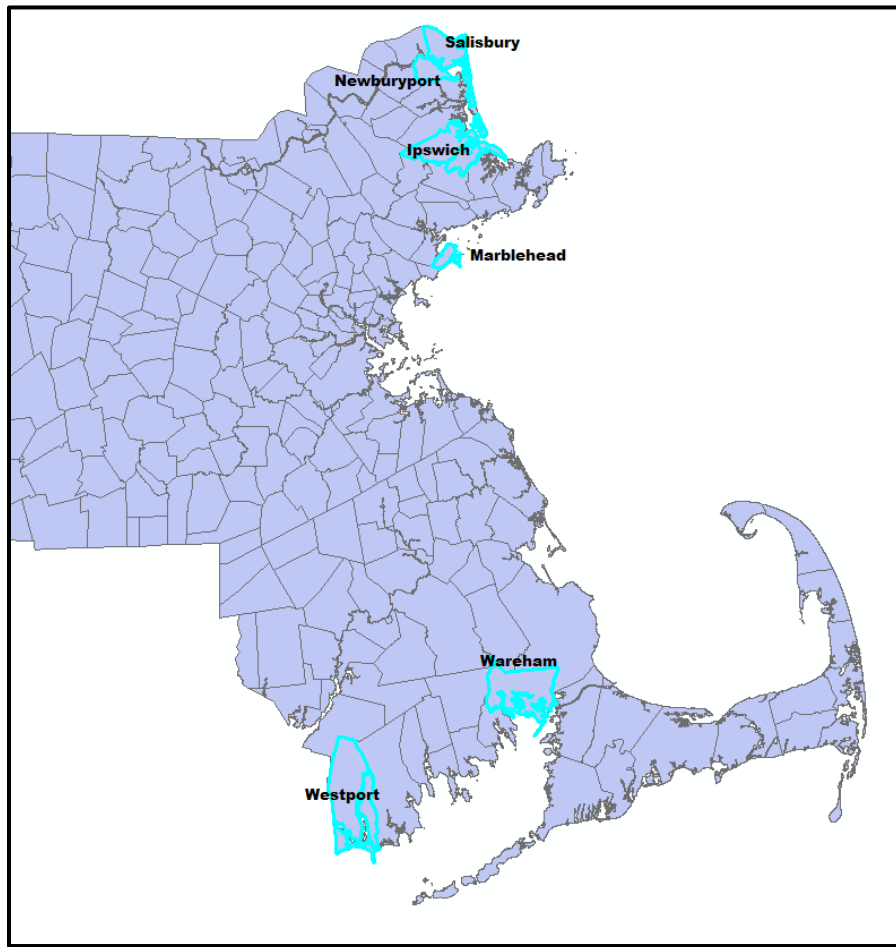

Figure 5- The towns listed are Salisbury, Newburyport, Ipswich, Marblehead, Wareham, and Westport, in order from North to South. (Source: MassGIS data)

3.1 Selection of Three Case Studies

We began by determining which towns would be most beneficial to visit and whom in those towns to interview. We conducted our research on the coast of Massachusetts. To determine which towns, we considered various criteria that identified six potential case studies, shown in Figure 5. To determine who in these towns to interview, we spoke to each town planner and discussed which members of the community were involved with the creation of the hazard mitigation plans and would be willing to talk about the process. Figures 6, 7, and 8 give a brief history of the towns that were ultimately chosen as the three case studies: Salisbury, Marblehead, and Westport, respectively.

3.1.1 Choosing Towns

When determining what towns to include in our research we considered certain criteria that would create a diverse sampling. We wanted to limit our research to towns that were currently in the process of planning or had plans that expired. One consideration was whether or not these towns had considered including climate change hazards in their plans. For towns that had not, we also tried to find out why these hazards were left out of the plan.

Other factors taken into account included:

- Size: The smaller towns, in terms of both population and area, are affected differently by hazards because they have already limited amounts of resources, whether it is volunteers or place to locate displaced families.
- Infrastructure: Towns with newer infrastructure and buildings may be less susceptible to flooding and storms than older buildings, which have not been renovated in a while to keep up with updated drainage regulations.
- Economic Status: If a town has a lot of spare funds, then they can hire more staff and use more funds for hazard prevention.
- Dominant Industry: A community's income may be affected more by hazards and climate change if they depend on fishing or agriculture then if they work in factories or offices.
- Willingness to Participate: Perhaps the biggest factor was officials' willingness to participate in the study. Those officials also needed to be knowledgeable on the planning process in order to obtain the most relevant data.

Using these criteria, we narrowed down our search to three towns on the Massachusetts coast: Salisbury, Marblehead, and Westport. Table 2 shows information of the communities that we considered including the current status of these towns' plans and their sizes.

Brief History of Salisbury

On September 6, 1638, Governor Winthrop granted the twelve men the land north of the Merrimack River and west of the Atlantic Ocean in order to begin a plantation. This land spanned what would become approximately nine Massachusetts and New Hampshire towns, including Salisbury, Massachusetts. It is directly bordered by the Merrimack to the south and Atlantic Ocean to the east. Salisbury was founded in 1640, and its economy consisted mainly of farming, trading, and boat building on the river. The 1800s heralded the arrival of the railroad in Salisbury. The rise in visitors from the railroad made the beach a popular tourist destination (Salisbury, 2012).

Today, the Salisbury beaches remain a popular tourist destination and there are many hotels and campgrounds for visitors to stay at during the summer months. A large built up area surrounds the shore, composed of shops and beach houses. There is also a large and populated state owned beach open to public use (Salisbury Beach, 2011). As you head inland, the buildings give way to more open land. Salisbury is 40% forested areas and a third wetlands and estuaries (Salisbury, 2012). Salisbury is not as populated as it once was, as a third of all residences are vacant. An additional third of residences are rented, indicating temporary or seasonal housing mainly for the large summer population (U.S. Census, 2010). Salisbury has population of around 5,000 and a median household income of $56,205 (U.S. Census, 2010).
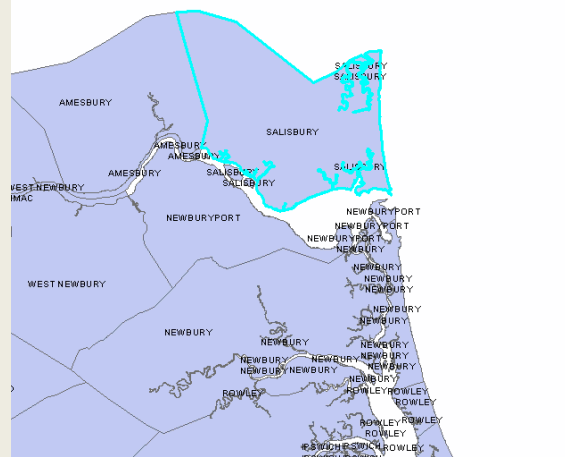
Figure 6 - Brief History of Salisbury, MA

Our case studies were strategically chosen to include as broad of a range of factors as possible, though they did still share some factors. Besides being Massachusetts coastal communities, the most consistent factor was that they each had a Board of Selectmen as their governing bodies. Between the three communities, they spanned the entirety of the Massachusetts coast line. Salisbury is the north most community, Marblehead is located just slightly north of Boston, and Westport is on the southern coast. This was done in order to see

how communities deal with a broader range of hazards that impact their towns. Salisbury is a community that is relatively large in size, but small in population with an average income level with a heavy dependence on summer tourism. Marblehead is an affluent bedroom community of Boston that is much more dense and populated than the other two communities and is home to a luxury sport. Westport is a mainly rural, farmland community whose population ranges between the other two communities, and also has a slightly higher than average income level more consistent with the average American. Further information about each of these towns is presented in the text boxes.

Table 2 - Potential Case Study Towns

Town	Current Plan Status	Size of the town
Ipswich	Updated in 2011	~13,000 residents
Marblehead	Updated in 2005 (Code unknown)	~19,800 residents
Newburyport	Approved plan as of 2007	~21,100 residents
Salisbury	Updated and Approved in 2008	~8,300 residents
Wareham	Nonexistent but currently being planned	~21,200 residents
Westport	Updated in 2005 (expired)	~15,500 residents

3.1.2 Determining Whom to Interview

There are many different staff members who can be involved in the mitigation planning process. These people can include the town planners, emergency management directors, building mangers, sewage maintenance, and other city officials. In most cases, the individuals' availability and willingness to participate were significant factors in deciding who to interview. The officials on the planning committee that were most involved in process varied from town to town, making it difficult to conduct consistent interviews with the same officials from each town.

Some individuals we interviewed in these towns were the planners, the emergency management directors, fire chiefs, and the water and sewer directors. Each individual had their own take on what should be involved, as well as insight about common problems they face while

24

planning. By interviewing these various types of people instead of just interviewing the town planners, we were able to better understand the group dynamics; what works and what does not

Brief History of Marblehead

Marblehead has had a rich early history linked very closely with various industries that found their homes in the town. Marblehead was incorporated as a town in 1649 by a vote by the Salem Town Meeting (Britannica Concise Encyclopedia, 2006, pg. 1191; Marblehead, 2012). In the beginning, the town was mainly a fishing port and shipbuilding center, growing their fisheries until the mid-1800s. The town attracted many of the passengers arriving from Britain as settlers and fishermen (Marblehead, 2012). It peak economic period is known as "The Golden Age of Trade" lasting from 1701 to 1775 (Purdin, 2011). Following a decline in the fishing and shipbuilding sectors, it was briefly a center for shoe factories in the late 1800s (Roads, pg. 37, 1881). During the same time period, yachting in Marblehead became very popular, attracting many to what would eventually be called the "Yachting Capital of the World" (Marblehead, 2012).

Marblehead is now known as a center for yachting and as a resort community (Britannica Concise, 2006, pg. 1191). It is the home of six different yacht clubs within its 19.6 square mile borders, only 4.5 of which are land, the rest being water. According to the 2010 Census, the population of Marblehead stands at 19,808 (U.S. Census, 2010). It is estimated that the median household income in 2009 for Marblehead is $92,218, a little less than double that of the US Median Household income for the same time period at $51,425 (U.S. Census, 2010).

Located about sixteen miles northeast of Boston, it is considered a suburb of the urban area. It is known for its two distinctive geographic parts: the rocky peninsula connected to Salem located on the opposite side of the Marblehead Harbor from Marblehead Neck. They are connected by a sandbar, currently home to a causeway that connects the two parts.
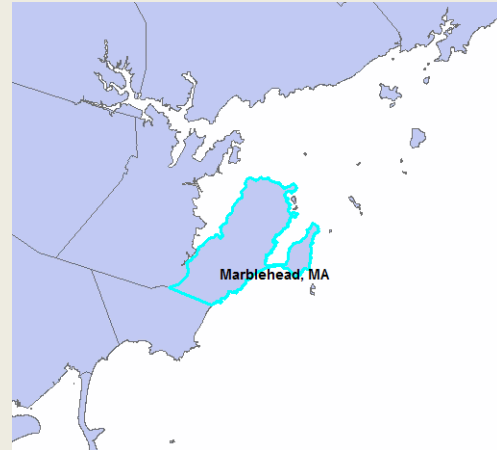
Figure 7 - Brief History of Marblehead, MA

3.2 Familiarizing with the Current Status of the Case Studies

This portion of our research was primarily archival and performed before our research interviews. It was necessary to fully comprehend our case studies which meant familiarizing ourselves with their histories, economic status, current hazards, past planning activities, and any information we could gather regarding their hazard mitigation plans.

Table 3- Selected towns and their attributes

Town	Prevailing Industry	Medium Household Income	Topography
Marblehead	Resort Community	$92,218	-Rocky peninsula extending into a bay -Neck connected to mainland by a long sandbar with a causeway
Salisbury	Summer Tourism	$56,205	-Much of town is covered by marshes -Bordered by Merrimack River to the south and Atlantic Ocean to the east
Westport	Farming	$62,761	-Bordered to the west by Fall River and a Buzzards Bay to the south -The two branches of the Westport River both run through the town

3.2.2 Evaluate Past Hazard Mitigation Plans

All towns in Massachusetts that have hazard mitigation plans are required to include elements of public involvement as per the Disaster Mitigation Act of 2000. This made researching about their current mitigation plans easier, since there was information freely available to the public. Since Marblehead and Salisbury had already created hazard mitigation plans, we were able to find their plans either on the town's website or directly from the town planner. This is the official plan that is submitted to the state and serves as a guiding document for all planning committees and commissioners in terms of hazard mitigation. These documents may not have information about the current state of the plans, but they usually include contact information for committee members, who we wanted to interview. If the town does not have a completed or up to date plan, there will be information on the matter through the aforementioned sources.

We obtained the plans for the communities we planned to conduct interviews in and studied them. This gave us some insight as to what has been included in the plan so that we could utilize that information during the interviews. We were able to find the hazard mitigation plan for

Salisbury on the town's website and obtained the plans for Marblehead from the town planner. Westport's last plan was approved locally but was never submitted to FEMA and so we were not able to obtain it.

We also researched existing hazards in Massachusetts. Each town will have different hazards depending on its location, so details and particular information will have to be gleaned from the town hazard mitigation plan or specified research. The Massachusetts' state hazard mitigation plan has information about weather and climate related hazards for the entire state as well. We found it useful to view hazard mitigation plans from other towns like Hampden and Dracut to see what kinds of hazards they face and what sort of solutions they have implemented.

Brief History of Westport
Westport is a coastal town on the Southern shore of Massachusetts. It was first settled in 1670, at the time part of the town of Dartmouth, and did not get incorporated as its own town until 1787. This new town was named for its location at the western most point of the Massachusetts Bay (O'Neill, 2009). When Dartmouth was founded, it was primarily used as plantation land due to the abundance of farmland, waterways, and protected harbors. After Westport was incorporated in 1787, it remained a small farming community with water-powered grists, saw, corn and fulling mills and an active fishing industry that was established in 1775 (O'Neill, 2009).
As of 2009, Westport had a population of 15,269, with a median household income of $62,761 (U.S. Census 2010). It is now a part of Bristol County and has a total area of 64.4 square miles (U.S. Census 2010). The town is primary residential, with a large farming community, and serves as a summer destination for the area due to the Horseneck Beach State Reservation (O'Neill, 2009).

Figure 8-Brief History of Westport, MA

3.3 Conducting Interviews

The most essential parts of our project are the gathering and analysis of our data, specifically the interviews we conducted with the town officials. We employed grounded theory in our data gathering and analysis. Grounded theory is a process that does not establish a hypothesis before gathering data, but rather begins the process through obtaining information (Berg, 2004, pg. 272). Though we have researched what potential barriers would be, we will not

be making any claims with the hopes that the interviews will support those claims. Instead, we will use our analysis of the interviews to report what the actual hazards are.

3.3.1 Grounded Theory

The grounded theory approach to interviewing is in some ways almost a reversal of what is seen as a traditional research method. Instead of beginning with a hypothesis and then setting out to prove it, research begins with data collection. In this approach, the researchers are able to create an interview guide and ask questions that do not steer the interviewee toward the answers they want, but instead allow them to provide their own answers (Berg, 2004, p. 272). With this method, the data are organized into categories based on their content and from these groupings a theory on the topic is developed (Berg, 2004, p. 275-276).

Use of this theory worked well for our research because it allowed us to determine what the problems were that hazard mitigation committees experienced without exposing interviewees to what we thought they should be experiencing. Organizing our findings into categories and grouping them was an effective way of figuring out what town officials thought were the most pressing problems and what assisted them while planning.

3.3.2 Preparing to Interview

Good interviewing skills are integral to conducting a successful project. As such, we improved our interviewing skills through four ways. First, the group began by reviewing current plans and the towns' circumstances in order to gain a better understanding of what hazards each town faces as well as how they have dealt with them in the past. Second, we reviewed past interviews conducted by others studying the topic of hazard mitigation along the Massachusetts coast and evaluated what they did well and poorly, as well as identifying some potential questions that could be asked. Through this research, we gained a small amount of information about the situation in general as well as relevant terms and buzzwords that helped us present ourselves as trustworthy and informed interviewers. Third, we studied various interviewing techniques such as standardized, semi-standardized, and unstandardized interviews. We determined that a semi-standardized approach, one in which we have a mostly structured set of questions that can be deviated from, would be the most useful to accomplish our goals. Lastly, we developed the questions that we thought would be useful to ask town officials. The knowledge that was gained assisted in the interviewing process because it allowed us to create effective and efficient questions.

During this time, we scheduled interviews with as many town officials as was possible in order to maximize the number of interviews conducted. It was also essential that we had a variety of possible questions to ask depending on each interviewee's area of knowledge. Thus, we created an interviewing guide that outlined questions we planned to ask and spilt them up into different areas. One area consists of easy questions that establish personal details of the interviewee, such as their role in the planning process and hazards they are concerned about. Another area consists of questions that deal with the community's hazard planning process, such as the frequency of planning in their communities and hazards the community regularly face. The most important area contains questions that determine what barriers and facilitators exist in the planning process. For the most part our questions were aimed to include topics on financial limitations, information accessibility, and public concern about the issue. There is also an aspect of climate change present in all these areas in order to carry the main topic throughout the interview. The interview guide can be seen in Appendix A.

3.3.3 Interviewing

The interviewing process is the primary way that we gathered data to identify the barriers. We met with individuals in the location of their choosing. The first thing we did before beginning our interviews was present the individuals with the consent form, which states that they are willing to let us use the data collected from their interviews in our report, and explained its contents to them. After they agreed to and signed the consent form, an audio recorder was set to ensure that all data was captured and stored sufficiently. Group members alternated being the interviewer while the others helped during the interviews by offering up additional questions that they thought may be useful. All group members in attendance had an interviewing field guide, shown in Appendix A, with the basic outline of questioning that the main interviewer followed and spaces for notes. Each interview lasted approximately 30 minutes to an hour, whereupon we inquired if additional contact was permitted for any follow up questions that were determined in the initial analysis portion of our process as well as if they would be interested in a copy of the report once we had finished our research. Prior to conducting the interviews, we established how these interviews would be evaluated. The focus was mostly on barriers and facilitators, what individuals perceive, and also the climate change hazards they are concerned about. During the interviews town officials primarily lead the discussion and we asked set up questions to steer

them in the direction we were interested in. The effects of climate change within their community were integrated into the conversation as frequently as possible.

3.3.4 Initial Analysis

It is important to analyze each interview soon after it is conducted so as to improve each successive interview. During the initial analysis, any potential questions for follow-up that were not thought of during the interview, but are relevant to the topic were identified. This includes potential barriers that were briefly mentioned but not expand upon due to time constraints, identification of other individuals that might need to be contacted, and any other details the interviewee was unsure about during the interview. Upon completion of this initial analysis, follow up interviews and meetings were conducted with the individuals that were willing.

We preformed our analyses through the use of grounded theory. This theory works well for our case because we are not trying to test the validity of a claim, but rather, to identify the range of factors affecting the outcome of the hazard mitigation planning process. Using this method, we took the gathered data, extracted the useful information, looked for patterns, and consolidated the information, step by step into distinct conclusions. First, we each transcribed an interview and picked out quotes that we thought were relevant. These quotes were those in which the interviewees discussed topics directly related to an aspect of the planning process that could either hinder or help the committee in planning. Then, the transcribed interviews were analyzed by the group, who chose quotes by the individuals that were then extracted and labeled with a short description. These descriptions corresponded to the main idea of the quote and were used to make the quotes easier to organize and find later when writing the findings chapter of the report. Lastly, the quotes were grouped into categories based on their topics and from those groups we were able to draw conclusions about our findings.

3.4 Identifying Barriers and Facilitators

The analysis of our data illuminated the barriers and facilitators present in hazard mitigation planning. During the analysis of the interviews, it was found that there was a significant amount of common barriers between each town. These barriers were discovered and categorized into the groups: access to experience and knowledge, available funding, resources and time, perceived importance, coordination and communication, and climate change. However, the causes of the barriers are more important than the barriers themselves. Knowing the causes of the barriers will allow a community to get to the root of the problem and overcome the barrier

from its source. To help communities address the barriers in the planning process, we emphasized these causes in this report. We also addressed potential solutions to eliminating those causes, based on the facilitators we observed, and thereby eliminating the barriers based on our observation of what towns have tried, both successfully and unsuccessfully.

In the final barrier analysis, we used a method that involved selecting quotes from the interview and organized them into the larger groupings of the topics mentioned above in order to determine barriers and methods to cope with them. After collecting and analyzing all the transcripts we grouped the quotes together into broader topics with smaller sub categories. For example, we separated our access to knowledge and experience into the smaller sub categories of staff information, public knowledge, and outside expertise.

From the data we determined the causes of the barriers and why they impeded the planning process. We then proceeded to analyze which methods used to counter barriers worked best and which methods were not as effective. By use of our past research and our analysis of the data we provide suggestions for overcoming the observed barriers and explain why the facilitators can be useful tools for hazard mitigation planning. In the next chapter we will discuss the data found within each category and provide quotes and examples from our interviews.

4. Findings

During our interviews, the main discussion regarding barriers and facilitators was in regards to creating a hazard mitigation plan. The first priority was to meet the requirements necessary in order to complete the plan among those we interviewed, not including climate change adaption. Unfortunately, many viewed the plan itself as a low priority due to the limited time and resources members were able to devote to planning as a result of more pressing job responsibilities. The categories of our findings did not adhere to the structure that we originally outlined (i.e. social, economic, institutional, and individual perception), but rather developed into more unique categories. A variety of resources are required to complete a hazard mitigation plan. They include experience and knowledge, funding, staff time and personnel, and staff motivation. In the following section, we discuss the barriers and facilitators for accessing and obtaining these resources. In this chapter, we elaborate on our findings structured as these unique categories: access to experience and knowledge, access to available funding, availability of staff time and personnel, perceived importance and urgency, coordination and communication, and climate change.

4.1 Access to Experience and Knowledge

In order to make a hazard mitigation plan, those involved with creating the plan as well as the citizens of the community need to have information on what hazards the community faces and how to solve them. Sometimes, this information is outdated, or there is not much of it readily available. Sometimes, those attempting to locate the information just do not have the experience necessary to find it or understand it. In this section, we will discuss this problem as well as show how having experienced members or consultants helping the committee has made the planning process easier.

4.1.1 Staff Information and Education

Finding: *Lack of experience can present a barrier to hazard mitigation planning. There are two aspects to experience with prior plans: a) understanding the process and b) familiarity with past plans.*

One aspect that we noticed was important for a community in creating a hazard mitigation plan is an educated staff with access to resources. Without at least one person on the staff who knows how to create a plan, all the members will have to learn as they go, taking up more time, which in turn causes a lack of motivation among the group. If the team has an ample

supply of data and members with prior experience with hazard mitigation planning, the process will go quicker and smoother.

Two of our interviewees said that they were not very familiar with their communities' planning process. They stated that although they were on the committee, neither had ever attended a meeting, and subsequently knew nothing about the process. FEMA and MEMA do offer workshops to help educate the committee members on how to make a plan. However, these are not always accessible or convenient for those involved in the planning process to attend. Only a certain number of these workshops are offered, which are often far away and interfere with the other job responsibilities of the town officials. One interviewee stated:

> "When I'm going on my day off and I'm not getting reimbursed for it, I'm not getting compensated for it, I've got other things that I think are more pressing, what's the incentive to go?"

Resource databases are now being made available to the emergency management planners in some communities in order to help them collect information and resources. However, while some communities have relevant data, others have studies that can be outdated or hard to access and therefore provide little use. One town had an old study from the 1980s that was never computerized and so was not readily accessible.

The committees that are revising their hazard mitigation plans are composed of individuals appointed to the committees based on their current position, rather than their experience with the planning process. Unfortunately, due to the infrequency of revisions to hazard mitigation plans, positions in a town can be filled by different people each time a plan is revised. For example, when looking over the names associated with creating the community's past hazard mitigation plan, an emergency management director in one town stated that few of those individuals involved with creating the previous plan still served in their respective positions. In situations like this, many of our interviewees were supported and assisted by retired committee members and others who were more experienced and willing to guide them through the process. An experienced interviewee in one town noted that "when I retire, I don't know what they'll do here. I've put a lot of time into this and I've been around enough, long enough, and experienced enough that when something happens I know what to do."

4.1.2 Public Knowledge

<u>Finding</u>*: A supportive public can facilitate hazard mitigation planning, while a community that lacks understanding of hazard causes and impacts can impede hazard mitigation planning*.

Although the each town had a committee of town officials responsible for creating the plan, public input was still important to the planning process. Both Salisbury and Marblehead held open town meeting to gain public input on the plan and held votes to approve the plans. All three communities provided the public with ways to learn about the issues. However, the public still displayed a lack of interest or confusion about the topics.

When the towns hold these meetings it's hard to get a large part of the community to respond and attend. One town planner commented "you send out 4,000 notices, you get about 40 people, and it's still not a large percentage of the people." In order to get as much support as possible, the same town records and televises the meetings, as well as provides information in the paper and extends the timeframe that people have to send in their input past the actual meeting itself. This helps to facilitate the public input portion of the planning process.

The downside to having public meetings is when the public votes against plans because of how it affects them directly, and not what it will do for the town as a whole. For example, when talking about a breakwater plan that got denied, one interviewee noted that "it was turned down primarily because of aesthetics. People didn't like it. People didn't like the looks of it." As a result, it was difficult for this town to gain support when attempting to put the breakwater back in the plan. When asked about the level of public interest, one of the planners explained that "Do I think they get the information? Yes. Do I think they all consider it the same way I do? No." Sometimes even when the information is available, the public cannot or does not take the time to interpret it the way the planner does.

In some cases however, if the public is educated and interested in the topics they can be a useful tool in pushing the town to accomplish important things. One interviewee noted that the citizens were pushing to repair an important road after a major storm, which involved setting up a hazard mitigation plan. In two towns, we were told that the turn out at the public meeting was relatively high. This shows an interest by the people and a desire to learn about, and give their opinions on the topics discussed.

4.1.3 Outside Expertise

Finding: *Contracting experienced consultants can facilitate hazard mitigation planning.*

Due to time restraints and a lack of knowledge and experience of the staff, it may become necessary for the town to hire outside consultants to assist in creating their plan. Hiring people with more knowledge and experience can make the planning process more efficient for the town. Since these consultants have worked on plans before and have familiarized themselves with the requirements, they can be useful tools to educate and help the planning committee.

These consultants can make the process run smoother and be of great use to a town that lacks experienced committee members. MEMA and FEMA offer grants that assist towns in the planning process, providing them with money for resources like consultants. One town planner noted that once their town engineer retired there was no longer any one person to take the lead on the hazard mitigation plan. As a result, the town hired a few consultants to take the lead on revising their new plan. A big concern with hiring consultants seems to be finding the right one that is experienced enough and still gets along with the committee. The same town planner explained: "it's also key to pick the right consultant, you know, someone who can talk to everyone, someone who isn't too [technical]… you just have to get the right person." If a town doesn't find a compatible consultant, there may be disconnect between the two parties, resulting in conflicting views on what the plan consists of.

4.2 Access to Available Funding

As we conducted our research, the most consistent complaint regarded the lack of available funding that each community had. Proper funding is needed to provide resources necessary to creating a plan. These resources include individuals who are experienced, relevant information, and studies needed to evaluate current status. We will discuss the barriers that are associated with resources later in the report. In this section, we will discuss the difficulty associated with traditional funding sources and the barriers and facilitators associated with obtaining outside grants.

4.2.1   Traditional Funding Sources

Finding: *Adequate funding to support hazard mitigation is not readily available from traditional funding sources:*

- *The local community because of already limited funding availability.*

- *Regional and State agencies with dwindling funding to disperse among communities.*

Communities traditionally obtain funding for planning from taxation collected from residents or from funding provided by the state or state agencies. Some of these funds are distributed regionally which becomes an important source of funding for communities, as an emergency management director stated in an interview:

"Every year there's a certain amount of money that becomes available to every community in that region and that's been a tremendous help for us"

In some cases, larger agencies, like Coastal Zone Management, will actually assist with the planning process and hazard mitigation when they identify a community with specific issues they are interested in, and utilize their resources there. In another similar situation, the regional planning agency obtained a grant that allowed them to assist all of the communities within their scope draft hazard mitigation plans.

Unfortunately, communities are increasingly faced with dwindling funding for programs that were previously allocated by the state. One emergency management director stated that the funding for hazard mitigation is not as readily available as it was 10 to 15 years ago, noting that the federal government is responsible for cutting funding available to states. Individual communities are subsequently affected by reduced state funds as they rely on state funds for many projects like these. Another stated that enough funds simply aren't available from state agencies like MassDOT and MEMA to fully create the plans. He believed the lack of funds from agencies is caused by a lack of priorities as well as a lack of funding over mitigation planning.

4.2.2 Grants

Finding: *Grants provide impactful and necessary funding in order to create plans, though there are many obstacles associated with obtaining grant funding.*

When there is simply not enough funding available through these traditional means, communities have come to rely on grants from outside agencies. One planner noted that "without the grant, [the plan] would probably be very difficult to do" which only underscores the lack of traditional funding sources for communities. However there are very specific barriers associated with obtaining grants that prevent communities from having an adequate amount of funding.

4.2.2.1 Specificity and Availability of Grants

Finding: *The specificity and limited number of available grants makes it difficult to obtain much needed grant funding.*

The most significant problem with obtaining grant funding is identifying suitable grants to meet the community's needs. One town planner noted that "grants are few and far between," which emphasizes the limited number of available grants available to communities.

The specificity of available grants continues to exacerbate the problem. The same planner noted how community's needs are much more specific than the grants that are available, calling most grants "cookie cutter." If grant criteria are too specific, projects and the criteria may not match 100%, and only a portion of the project is funded by the grant. Communities must look to additional sources, applying to more grants or relying on already limited town reserves to fund whole projects. This becomes a significant problem as many of these projects cost a large amount (regularly on the order of hundreds of thousands), and the town is left footing the considerable bills.

A solution to the barriers created by limited availability of applicable grants was noted by an interviewee. In order to complete a project like planning, communities should seek an agency that is interested in doing work that overlaps with the community's interested. Working with agencies provides communities with assistance and funding the communities need to fix their problems.

4.2.2.2 Competition for Grants

Finding: *Competition with other communities for grant awards reduces the likelihood of securing funding.*

The limited number of grants creates a difficult situation for communities. Unfortunately, the problem is exacerbated by the level of competition for these grants. One planner states that obtaining grants is difficult because communities "compete with the whole country." Communities need to show that they have the greatest need for the funds which becomes very difficult and time consuming to accomplish. In cases like Salisbury, grant requirements are based on eligibility factors like population, which is not always the best indicator of need.

4.2.2.3 Perception of the Cost vs. the Benefit of Applying

<u>Finding</u>: *Even when grants are available, communities may not believe the benefits justify the effort of applying.*

The problems that are associated with obtaining grants leads to a greater barrier: the lack of perceived benefit for communities to apply for grants. Communities will consider the costs associated with applying, the likelihood of receiving the grants, and the potential benefits and sometimes conclude that the effort is better spent elsewhere. Some communities will forego the application for a grant and not create a plan, instead fixing specific problems when they appear. For example, one of our interviewees explained:

> "We're probably not going to apply for hazard mitigation plan to fix these things, we're probably just going to fix them for a hundred thousand dollars instead of ask for one hundred thousand dollars"

The same planner noted that "those federal grants are really hard. They're hard to qualify for and they're hard to do the follow-up on." There is a significant amount of associated paperwork that is required to be completed correctly in order to even be eligible. As one interviewee noted, they must jump "through all those hoops and making sure the paperwork's all done right to get those funds" This becomes a significant issue for communities with limited personnel (a topic that is discussed in 4.5.3) as there is no incentive to apply for grants. One emergency management director stated that that "without any kind of incentive or any kind of push like that, it may be a while before I do anything with [grants] because I've got other things that I think are more pressing to get done." The kind of effort that is required to obtain outside funding translates to additional time by staff. They believe their time would be better spent elsewhere on immediate problems.

Even when a community is awarded with grant money, the distribution may not come when they need it. A fire chief noted that their town was awarded a grant ten years ago, but they expect the funding to be received next year in order to fix a problem at least ten years old:

> "They applied for a grant I want to say ten years ago and I believe maybe next year that's going to finally happen and all that is a wall to hold it back. These people been living with that for ten years"

Though this interviewee was discussing a grant related to disaster recovery, such an experience leaves a mark. The time associated with grant money, including the application, follow-up,

decision and distribution is a cost that communities are not willing to spend. When communities believed they are authorized to spend money which will be reimbursed later through grants, other problems arise. One emergency management director noted that their town had spent around thirty five thousand dollars and was ultimately never reimbursed after they had been awarded a grant. Town officials may remember that experience and ultimately decide not to spend the time to apply. They believe that the town will have to allocate the funds and/or time, regardless of grant awards. If the benefit of grants cannot be fully appreciated by communities, their perception of the cost significantly outweighs any potential gain.

4.3 Availability of Staff Time and Personnel

Possibly, the most important resource is staff persons available to create the hazard mitigation plan. To us, available staff was defined as those individuals that have the skills to work on the plan and have the time to do so. Unfortunately, in many of the towns, available manpower is limited or nonexistent. Those involved in the process have other time demands that ultimately lengthen the planning timeline. When there is an individual who is committed and enthusiastic about creating the plan, the planning process is expedited, and the plan is completed. In the following section, we discuss these topics in more detail.

4.3.1 Staff/Manpower

Finding: *Staff members with availability to work on the plan are valued resources due to their rarity.*

A lack of staff or manpower was an issue in all of the communities that we studied. When asked about the town staff, one emergency management director stated, "We need more people." It becomes clear that many communities need additional staff to do work. The same director believed that the lack of personnel is growing to be "more and more and more of an issue." A town planner solemnly reflected on how she could have used additional help while drafting the plan. She noted how busy the entire staff had been. Unfortunately, many towns cannot afford to hire additional staff or consultants because of a lack of available funds. In one town, the solution to the problem of limited staff members was to rely on volunteers to substitute for staff members. Among the three towns, the emergency management director positions consisted of one volunteer, one part time staff member, and one full time staff member. A volunteer emergency management director noted sometime similar:

"In many communities, and I could list them time after time after time, it's either

the fire or the police chief that has [the emergency management responsibility], so

he's doing his job as fire chief and then he's trying to do this job too. It's just too

taxing: the planning and everything that they want you to do."

Another interviewee notes that volunteers are limited, which hurts communities even further.

Even when towns hire part time staff, the demands are equal to those of a full time

position. The part time staff member was an individual who also held a position in the fire

department. The dual positions make it difficult for him to focus on emergency management as a

priority:

"It may be a while before I do anything with it because I've got other things that I

think are more pressing to get done. And that's just the EM side of it, not to

mention the fire department side of it that I've got things going on. Again, if I had

full time hours to do it, it would be different."

The emergency management position has the demands of a full time one. . By not having

someone who is fully committed to the position of emergency management, the community is

hurt.

4.3.2 Lack of Time Resulting in a Long Timeline

<u>Finding</u>: *Limited available staff translates to limited time to create the plan, ultimately*

lengthening the completion of the process

The lack of staff to complete a hazard mitigation plan translates into a lack of available

time. As each individual is busy with their own positions, collectively it becomes difficult to

come together to work on the plan. Their schedules could not accommodate the creation of the

plan or the committee meeting necessary to discuss the plan's contents. When asked what the

biggest barrier is to creating to hazard mitigation plan, one interviewee said "It's the lack of time

to get together and work on it," that is the problem. Another member of the community stated a

similar sentiment, but also added that individuals working on the plan lack focus. She even went

as far as to say that this was the largest barriers to hazard mitigation planning. A lack of time

translates into a lengthier timeline associated with the plans completion. A planner in a

community discussed the length that is usually associated with creating a plan. She stated that it

takes "a couple of weeks to coordinate schedules, and usually, if we have other things to talk

about, it's even easier [to schedule meetings]." Though it is vague, a couple of weeks can be a

considerable amount of time when attempting to hold multiple meetings regarding the subject. She stated that it takes even longer when the meetings need to include individuals from outside agencies like FEMA and MEMA:

"If it has to deal with state or federal officials like this FEMA grant that we're working on, it could take 2 to 3 weeks just to get a date that most of the people can attend and a lot of times you have a couple people conference in because they can't get here from Boston."

One community began their hazard mitigation plan following Hurricane Irene, making the plan a priority. However, as they moved further away from the event, the committee meetings were less frequent. When we interviewed one member of the town in December, they mentioned that the last meeting occurred before Thanksgiving and they did not expect to hold another until the New Year, significantly extending the timeline.

In some situations, a long timeline is a problem because it causes a lack of interest amongst individuals. One planner noted that the nature of the process is very involved, requiring a lot of necessary information and a lot of time. One emergency management director noted that the part of the process that takes the most time is the infrequency in which the state evaluates proposals and subsequently funding for projects, slowing down the projects:

"That money only becomes available once a year so that's why you can get into a two or three year, if you're lucky, you can get moving in two to three years. It takes time; it takes a lot of time."

4.3.2.1 Staff Consistency and Turnover

Finding: *Staff consistency becomes a problem with lengthy timelines, making it difficult for staff members to maintain the same priorities and avoid confusion on job responsibilities and status of the plan.*

As a result of a long timeline, there can be a lack of consistency among the staff. Staff members can retire or leave their position. When there is a new individual in that position, they may not know the process related to hazard mitigation planning. This is especially a problem if those new individuals do not want to participate with the creation of a plan. One planner noted "a lot of department heads have been changed since [the last hazard mitigation plan] has been done so there might be very different priorities." The difference of priorities shifted the objectives from what those were in the past plan.

The retirement or departure of one individual can result in the division of responsibilities among multiple individuals. In one town, the planner noted that no one person is now responsible for the hazard mitigation plan, as the responsibilities of the position have since been split up following the retirement of an integral committee and staff member.

Staff turnover also results in confusion. When one interviewee took over his position from another individual, he emptied out his predecessor's office. He did not thoroughly inspect each file to the sheer volume. As a result, he was unaware of some of the more infrequent aspects of his job. He said:

> "This [hazard mitigation plan] was in the files when we cleaned his office out, I know it wasn't here. We emptied a lot of file drawers out; I didn't have time to read it all. I didn't know what was expiring, when it's expiring, what we need to do to keep it going"

4.3.3 Champion

Finding: *An individual who champions the plan keeps other committee members motivated, ultimately completing the plan.*

Possibly, the best resource to have in order to complete a plan is an individual who is willing to push the plan to completion. That individual will champion a plan, scheduling meetings, obtaining data, writing the plan, etc. One interviewee had past experience with the planning process as they had participated on multiple plans in past positions. This person really understood what needed to be included in the plan and has been the person who is actively working on its creation.

Another community had a champion for the plan but lost him to retirement. The individual, formerly the town engineer, was noted by one interviewee to have "really understood every aspect of the hazard mitigation and he was in charge."

4.4 Perceived Importance and Urgency

Hazard mitigation plans have a long timeline, and are normally seen as less urgent than other problems a town has to deal with, and therefore less important. In many cases, the staff already may have a lot of other emergencies within the town to deal with, so it is hard for them to focus on the plan. As a result, sometimes hazards are not addressed until after they occur. In this section we will talk about how a staff handles their workload as well as how exposure to a major hazard can push a community into action.

4.4.1 Staff

As previously mentioned in the last section, the staff in particular has problems dealing with the added responsibility of creating this plan. One interviewee noted that hazard mitigation planning has the workload of a full time job, making it hard to balance with their other job responsibilities. Therefore, the committee members must prioritize their tasks, which do not always favor development of the plan.

4.4.1.1 Various Priorities

Finding: *Competing work responsibilities and priorities can be a barrier to completing hazard mitigation plans in a timely manner.*

The town officials who work on hazard mitigation plans have other priorities besides the plan. The committee members are not only on the planning board but also have major responsibilities in the town, like the fire chief or the town planner. Creating a hazard mitigation plan requires a lot of time that most people do not have and cannot afford to give while still balancing the rest of their work. A planner stated that:

> "We don't have extra people in this town and I'm sure that's not unique. So when we take a couple hours to do something like this, it gets people away from the other elements of their jobs so sometimes it's hard to just get everyone around the table focused on the task at hand."

Because of this conflict of priorities, meeting to talk about the plan can be difficult. Coordinating schedules is a problem for multiple towns, and one interviewee noted that when they need to meet, it takes two to three weeks just to decide on a date that most people can attend. Another town took a couple months off from planning because the committee members became too busy. In every town, the interviewees noted that having extra personnel whose job it was to just to assist in the planning process would be helpful since they have so much of their own work to focus on.

In many cases it is easier for the committee members to prioritize more immediate problems over ones with long timelines. For example, one planner explained to us:

> "But like the DPW director, the fire chief, as you'll find, it's harder to meet with them because those are things they know they have to deal with but they tend to deal with it as the emergencies come in."

Even the town planners have more pressing responsibilities like creating the town's master plan. When all these responsibilities stack up, the officials have to weigh the benefits of attending to one thing before another and then decide if the work load is worth the potential payout. Because the hazard mitigation plan takes a while to make and get approved, it is harder for the officials to make it their top priority when other more urgent matters also require their attention.

4.4.1.2 Confusion of responsibilities

One major problem for those trying to balance these responsibilities is being a part of the hazard mitigation planning committee is not included in their everyday responsibilities and so there can be confusion as to what they need to do. For example, one interviewee had told us that he was not even aware he was on the committee until we contacted him and he wasn't really sure of his role. Some involved on the planning board are simply not quite sure of their role or what they should be doing. This confusion can sometimes make the planning process more difficult or cripple it. In one town a past plan did not go through because it was never sent off for approval by the state after being approved locally. On a less drastic level, one interviewee explained that the planning process had lost momentum, and it was going to take someone to start it up again, but they didn't know who was supposed to make the move to do so.

4.4.2 Town Motivation

Finding: *Recent experience with hazard events can create incentives to revise hazard mitigation plans.*

Major hazards sometimes turn hazard mitigation planning into a higher priority for citizens and staff. People tend to deal with things as they occur. As one interviewee pointed out "[planning ahead is] something that probably makes sense, but nobody thinks about it a lot until the next big storm." In this situation, the town experienced major problems as a result of these storms and afterward they started to plan for future occurrences. One town could not obtain funding to fix the damage after hurricane Irene because they lacked a mitigation plan. After the storm, they started their plan and thought about measures they could take to prevent some of the more serious problems from occurring during the next storm. Another town lost a significant part of beach during one storm. Though they had tried to haul in sand during the storm, it did not even last to the morning.

4.5 Coordination and Communication

When creating a hazard mitigation plan, it is important to ensure as much communication and cooperation between those working on the plan as possible. When the individuals working on the plan cooperate the planning process will go smoother and faster. The most important relationships that the town should have are those between the departments within the town and between the town and the various government agencies that assist by providing data and propose methods to mitigate hazards.

4.5.1 Between Departments

Finding: *Disconnect between departments within a town can be a barrier for effectively determining and solving problems.*

Having good communication between the towns departments allows them to better coordinate with each other during the planning process. A staff that works well together limits the amount of disagreement over the plans and allows the committee to establish each individual's responsibilities with limited confusion. This did not seem to be a major problem among the towns we visited however, one town planner stated, "This is a very cooperative town... We've been told that by many people."

Even with cooperation, these towns still experienced some disconnect between departments. One interviewee told us that the town was split up between different elected boards that each dealt with their own areas, such as seawater and sewer, harbor and water, and recreation and parks. Whereas splitting up the responsibilities is helpful, the interviewee also noted that there is no one person that overlooks and has control over all the boards. Another interviewee pointed out that this discontinuity sometimes makes it hard to know who to contact regarding specific topics. This results in consultants or other departments talking to the wrong people and not getting all the information they need when attempting to discover what needs to go into the hazard mitigation plan.

When there is an information gap of some kind between departments, it can lead to cooperation problems. This can also happen when new members of the committee are not familiar with the town. As one interviewee explained:

"Because today it's like they're hiring a new person… for the health department and they're going to hire a health person probably not from [here], probably doesn't have a clue about [this town]. That's where you lose your continuity"

When telling us about a project in their town, another interviewee told us about one department that was doing work on the drainage system. They were not informed that the size of the pipes were changed at some point and could therefore not finish the project in the way they had planned to.

Having a centralized board of officials in charge and readily available helps the town departments to stay organized and also makes the planning process smoother. It is also important to have everyone informed when locally approving hazard mitigation plans. One town planner pointed out that having just the board of selectmen review an issue is much more efficient than to decide on it during a town meeting. However, when it is hard or time consuming to have a meeting with the board of selectmen or the planning committee their communication is less frequent and therefore they may not be up to date on what is going on in the other departments.

4.5.2 Between the Town and Regional Planning Agency

Finding: *Establishing good relationships between communities and government agencies provides towns with easier access to studies and help for hazard mitigation projects.*

Just as it is important to have good communication within the town, it is also just as important for the town to keep up communications with MEMA and other agencies. By keeping these pathways of connection open, it becomes easier for the town to work with agencies like the Army Corp. of Engineers or Massachusetts' Coastal Zone Management (CZM). These groups can provide the town with information and studies as well as help them with plans for the hazard mitigation plan.

Many factors can affect the relationship between the town and agencies. For example, in one town, the Army Corp of Engineers spent a lot of time and money on planning a breakwater for the hazard mitigation plan. However, the proposal did not pass in the town meeting. After that the Army Corp of Engineers "expressed a reluctance to jump back in [helping with the plans] just based off the history and the amount of time and money they put in." Another problem that affects this relationship is when the town and the agencies have different priorities. One interviewee told us about problems they had working with the Massachusetts Department of Environmental Protection while trying to solve flooding issues in the town. The town's proposal to solve this issue may have affected local protected lands, so MassDEP would not let them do it.

However, when strong connections and relationships can be established, getting help and working out problems are much simpler. One town planner stated that they keep up these strong connections by:

> "We try to train our Conservation Commission by having different agencies come and talk to them about different things that are interesting to them, so by continuing to do that, you keep up the contacts when the people change and that type of thing. It's critical because then they'll send you their grant things too and you can talk to them about how to make something work for an issue that you are opposed to."

It is also important to keep these strong relationships with FEMA and MEMA. Both agencies make personnel available to help out communities. One interviewee commented on how helpful the FEMA representative he talked to was, saying that the representative offered to hold a workshop for the committee if they were interested. The same interviewee also discussed how FEMA was willing to anticipate and fix long term problems instead of just providing the town with temporary solutions. So if the town cooperates with FEMA on the plan, they may be able to come up with more effective solutions. With respect to MEMA, some towns have emergency management directors that work under MEMA, so these towns have a direct connection to the agency. MEMA also employs personnel whose sole responsibility is to stay up to date with the communities and help them to create their plans whenever possible. These representatives actively attempt to meet with the communities; however the representatives are responsible for multiple communities, so the communities themselves also have to make an effort to keep in contact. One interviewee said that the representative from the region office for MEMA gathers a group of about thirteen towns from the region together once a month to talk about what's going on in each town and the different things they are working on.

4.6 Climate Change

The subjects we interviewed had several different opinions on the notion of climate change. Some of the town officers said that they had witnessed the effects of climate change first hand, while others acknowledged that climate change might be an issue but offered no decisive opinion on the matter.

4.6.1 Perception about climate change

Finding: *Some committee members responsible for creating the plan do not perceive climate change as a significant issue.*

About half of all the subjects seemed to think that climate change could be a serious issue, citing rising sea levels and increased instances of flooding. One hazard mitigation planner said that there were "places in town that as a kid I never saw a flood. Now [during] any storm, that's a problem." Another insisted that "a lot of people don't believe [it], but the ocean is higher now than it's ever been." He also explained that it would be hard for someone who was not paying attention to see the changes because they are very gradual, and it can be years before there is any noticeable difference in flooding or sea levels.

The other half of the interviewees rarely said that climate change was not an issue, but rather said that they had not seen anything they could decisively say was caused by climate change. Only one interviewee within this sub group openly dismissed climate change, stating "Global Warming? I don't think it's got a [darn] thing to do with it." Three other interviewees stated that they did not have the knowledge to make any decisive statements on the matter. Even if interviewees did not acknowledge climate change as the cause, all interviewees within this subgroup stated that flooding was a serious problem.

4.6.2 Including Climate Change Considerations

Finding: *With the increasing difficulty associated with creating a hazard mitigation plan, an option section on climate change is a low priority.*

None of the three towns that we visited included a section in their hazard mitigation plan for climate change. However, one town had included considerations for climate change in their projects but not explicitly as its own section. The town planner had noted that elements of climate adaptation planning were "in the plan but not specifically as climate change." The town had considered rising sea levels while constructing a rail trail, because they wanted the project to last. The town had also fought to ensure that a new sea wall being constructed would be high enough to withstand rising sea levels in the future.

A planner in another town who was revising their hazard mitigation wanted to include a section in the new plan regarding climate change. The planner noted that there may be reluctance to include considerations for climate change in a plan because "climate change could be more political than anything." The hazard mitigation committee in another town had experienced trouble in the past when trying to pass measures against climate change in town meeting for aesthetic and monetary reasons.

According to our interviewees, FEMA and MEMA actively encourage communities to include climate change considerations in their hazard mitigation plans and provide useful support to help communities. These actions facilitate the inclusion of climate change considerations into community's plans. When one town planner met a MEMA agent at a planning conference, the agent noted how she "doesn't like the plans that come in without even a section addressing climate change." A section on climate change is still optional though. Most of the interviewees stated that they had a difficult time just finishing the hazard mitigation plan so they are not inclined to include optional sections. Despite this, the same planner who talked with the MEMA agent said that they were still thinking about climate change: "maybe it's only on our minds because it's on [MEMA's] minds, but it's there." Even though it may not be a requirement, if government agencies encourage planners to include considerations for climate change, then there is a significant chance that they will.

5. Discussion and Recommendations

Based on our findings, we were able to draw certain conclusions regarding the barriers and facilitators to hazard mitigation planning. These barriers and facilitators are all intimately connected, with any one topic relating multiple others. It is important to note these relationships as well as their significance in order to fully understand the situation surrounding hazard mitigation planning. In this chapter below, we discuss the significance of our findings and make recommendations. The structure of this chapter's sections mirrors the Findings Chapter's sections.

5.1 The Importance of Experience and Knowledge

While doing our literature review on potential barriers to the hazard mitigation planning process we might encounter, we did not discover any studies that discussed the staff's limited access to information. During our interviews however, we became aware that available access to information and data about hazards is essential for making an effective plan. When the staff and the community have a reliable and easy access to sources of information on topics like past plans, their area's hazards, and possible solutions to the problems, the creation of a hazard mitigation plan becomes a more manageable task. This information can come from experienced staff members, community databases, past studies, or even hired consultants.

5.1.1 Discussion

Based on our interviews, a lack of educated staff members on the topic of hazard mitigation is probably the biggest challenge a community faces when it comes to obtaining information. However, this topic did not appear in our literature review. If the staff lacks knowledge on what grants are available or how to create a plan, then they may not be aware of all the options or what is needed. If a staff member does not know what their responsibilities are, they will be less inclined to attend meetings or give input, leaving the planning to the more experienced committee members. There are workshops offered by FEMA and MEMA to help them learn about this process. However, the workshops are not always convenient for the staff members since workshops can be far away and take a significant amount of time to travel to.

We found that some communities encountered more difficulties finding studies then others. One town planner told us how she had no problem obtaining data on natural hazards, because she had previous experience with them. However, in another town, they did not have many studies, and those that were available were outdated and hard to locate.

Another interviewee discussed a new online database that their county was using to keep them informed available resources each town had as well as what they were doing in terms of planning. This information is useful for committee members, because it allows officials to share physical resources. Educating staff is a much simpler process when databases and studies are readily available and frequently updated.

The public gets most of its information from the staff, so if the staff is not educated, the public won't be either. This issue is more important in towns that hold open meetings where the citizens vote on issues involving the plan. Unfortunately, if the public isn't well enough informed, they may make choices based on a superficial aspect of a project rather than on whether it would be helpful or not. If they are informed they may be able to offer the staff member helpful new perspectives and ideas.

One of the towns we visited had implemented a few methods to involve the public. They televised their meetings, put information in the newspapers, sent out notices with their taxes and other municipal mail, and also extended the time that the public could offer input past the meeting day, all to encourage more participation. This town also separated the hazard mitigation topics over multiple meetings and integrated them into other discussions that the public found more interesting. These are good ways to obtain information from the public. By providing places to find information, the public has the capabilities to be more involved and to make more informed decisions. Breaking up the information into topics is consistent with the literature that suggested integration of adaption planning into other plans in order to raise interest and awareness.

When turnover is a problem, it is helpful to have people who have worked on a plan before there to help, whether they are a current staff member, retired staff member, or consultant. Many of our interviewees commented on how useful they found the input help of those with more experience. One problem occurs when there is no experienced member on the staff and the town must look to consultants, which cost money to hire. FEMA and MEMA do offer grants that give communities money for consultants and other resources that may be helpful during planning.

5.1.2 Recommendations

When the staff does not have enough information on how to plan or what hazards their towns face, it makes the already arduous process of hazard mitigation planning significantly

harder. There are a few things that can be done to ease the planning process. Some methods FEMA, MEMA, or the communities can employ to make this process easier would be to have MEMA staff meet directly with the committees, to develop resource databases, or to make towns more aware of grant opportunities.

Individuals on the planning committee have other responsibilities besides hazard mitigation planning and therefore may find it more useful to have more localized and convenient sources of information. MEMA and FEMA try to provide information and help towns with the planning process by offering workshops, but the committee members typically have to travel far and spend time they would normally have off to attend them. In order to better educate the hazard planning committee members, these organizations should hold workshops directly with towns to speak with the committees during one of their meetings. Having this more private and convenient type of workshop will benefit the entire committee instead of just the few who can attend the larger workshops.

Besides being educated on how to create a hazard mitigation plan, the committee members also need to learn about what kinds of hazards their town faces and how others have solved similar problems. Some interviewees noted that they had trouble finding older data or just didn't know if there were studies available. Something useful that would help these towns and make planning easier would be to develop a database that pools all of the towns' studies and data on hazards in order to make it readily available to the town staff online. Having access to such a database will allow towns to find the studies they need quickly and ensure that they have all the information they need to plan for hazards the best they can. These databases can also pool information from a whole region, not just one town, to allow the planners access to a broader view of what they may need to expect in the future.

A good source of knowledge for a town is having experienced staff to help them with the planning process. If a town has no experienced members on the staff, consultants can be a useful, but expensive replacement. FEMA and MEMA both offer grants that provide towns with money to hire consultants, but these can be competitive and time consuming to apply for. Sometimes, towns do not even know about these or other grants and may benefit from some form of database that lists these funding sources for them. If towns were made more aware of grant opportunities, or if the process of applying for them was more simplified, then it would allow committee members easy access to the experienced personnel they need.

5.2 Incentivizing and Prioritizing through Funds

The barriers and facilitators present in the literature failed to elaborate on the intricacies of grant funding while interviewees were reluctant to discuss allocation of town funds. As a result, there was very little overlap between the two. However, interviewees were enthusiastic to engage in discussion regarding the necessity of funding, sources of funding, and difficulties with obtaining grant funding. That helped create specific recommendations for both towns and government agencies in order to provide additional planning funding.

5.2.1 Discussion

As was expected, funding from the town for planning was insufficient. However, there was little information gathered on how the allocation of funds in towns occurs. Therefore, it was difficult to determine if the cause for limited community funding was a result of prioritization of funds to other locations or a complete lack of funds. However, interviewees did note that they usually obtain funds from government agencies and regional authorities as part of regular dispersion, though that funding has been reduced with time. The literature did not suggest such funding sources or their amounts' recent reductions.

The literature did note, but not to what levels, that it is beneficial for communities to receive grant funding. Among our interviewees, a significant majority noted not only how beneficial it was to have grant funding, but necessary to do so in order to engage in hazard mitigation planning activities. However, the literature only reviewed the result of the intricacies to the barriers associated with grant funding: the perceived cost of applying as much higher than the potential benefits of funding. Obtaining grant funding was a major problem with many associated different barriers; including lack of availability, specificity, and competition of grants; which we did find as a result of our interviews.

5.2.2 Recommendations

Communities need to seek and apply for more funding sources in order to plan effectively. Funding sources are essential to provide incentive for the staff members in the form of payment. However, it also eases the process of hazard mitigation planning by providing those essential resources committee members would want while creating this plan, thus allowing the process to be less arduous. Unfortunately, not all towns are fortunate enough to have a large enough tax base that allows them to acquire these additional funds. Towns have to rely on grants

that are difficult to obtain because of the associated amount of work, the level of competition, and the ultimate uncertainty of awards.

The mentality surrounding applying for grant funding needs to change in order for communities to obtain more funding. Two of the communities expressed a reluctance to apply for grant funding due to the cost of applying versus the potential benefits. In those situations, individual staff members do believe the funding would be helpful, but don't believe their proposal will be able to show the highest need among their competitors. This translates into a reduced number of applications from the communities for grant funding, limiting the funding that could be potentially received. Those two communities faced more significant problems creating their hazard mitigation plan than the other community. This is because the other community applied and was awarded grant funding in order to create their plan, allowing them to hire an outside consultant. Consultants have the responsibility to create the plan, and there is more incentive for them to complete their work as they are paid upon completion. The individual staff members feel a smaller level of incentive because they are not being paid to complete the plan, though they acknowledged the potential benefits of having a completed plan. But the fact remains that communities that do not apply for grants cannot possibly be awarded with grant funding. In order to assist the change in mentality, staff members must be willing to write and submit grant applications. However, change also needs to come from agencies as FEMA or MEMA need to educate communities on additional funding sources that would be applicable to communities.

It would also be beneficial for communities to establish strong relationships with outside agencies to create a channel with which to approach them. One interviewee stated a strategy to obtain funding from larger agencies is to find an agency interested in performing work that overlaps with the community's interest. While this is a great method of gaining additional funding to fix problems, the strategy is not simple. It often requires a considerable amount of work to determine which agency to approach and convincing them how the agency's motivations align with a community's. This could be potentially difficult if past experiences between the two parties are negative that would ultimately hinder future interactions. Whether is the community that is difficult, like in the case with the Army Corps of Engineers, or the agency that is difficult, like in the case of the lost reimbursement, one party is usually left with a reluctance to engage in business again. In the latter situation, communities will come to rely on themselves rather than

on outside agencies. As a result of this sentiment and their limited funds, priorities will be placed on their day to day responsibilities and any extra work, like planning, will be delayed. If that existing relationship exists, then agencies would be more willing to partner with communities and be aware of potential issues that would allow agencies to approach communities with funding and assistance.

5.3 Necessity of Available Staff

One of the most significant barriers that we found to hazard mitigation planning was a lack of available staff. However, there was little to suggest this would be the case from the literature review. Though the literature did highlight problems regarding the interactions of staff persons, it did not include the lack of time for staff persons to interact due to their availability, something that we did find as a result of our interviews. The most suggested solution to the problem of available staff would just be to hire additional staff. However, this can be difficult due to the already existing lack of funding.

5.3.1 Discussion

This topic was not addressed in the literature review that we conducted prior to our research. However, lack of available staff has proven to the most problematic hurdle to creating a hazard mitigation plan. Staff members are essential to the creation of the hazard mitigation plan because they are the ones who actually create the plans. Even in the community who hired consultants to create the plan for them, members of the community had to apply for the grant necessary to facilitate their involvement. Following the hiring of the consultants, members of the town departments had to make time to work with the consultants. Nothing can be completed without staff available to work on the plan.

5.3.2 Recommendations

People create a plan, and without people available to work, there can be no plan. Many of the interviewees noted what a difference it would have been to have extra staff working on the plan with them. It was clear that by not having extra bodies to work, it would be incredibly difficult to create the plan in a timely fashion. A significant contributor to the problem is not having enough funding to provide for additional help, whether they are in the form of additional staff or outside consultants. One solution is to initially hire individuals enthusiastic to fulfill the explicit and implicit job responsibilities in order to become champions. If all positions are already filled, there is really no easy way to combat the problem of lack of staff. It would be

difficult to ask and rely on volunteers to work on the plan, because it requires a skill set not readily available within the general public. Those that have such skills are likely to already have jobs and responsibilities, like staff members, and cannot dedicate additional time to hazard mitigation plans.

Possibly, the best method for providing additional staff would be outside assistance from FEMA and MEMA. The agencies could hire consultants that would visit towns in order to help communities develop their hazard mitigation plan. The consultants would act as the much needed champion, pushing to complete the plan, as it is explicitly in their job responsibilities. They would not solely responsible for creating the plan but would help facilitate its creation by scheduling meetings, talking to individual staff and departments to be accommodating to schedules, and instructing staff on what needs to be included in the plan. The consultants would work for MEMA or FEMA on a salary but would receive a commission from the town one a plan has been approved that would be less than an actual consultant would cost. This provides incentives for both the town to request for this kind of assistance and the consultant to work in a timely fashion in order to obtain more commissions.

Consistency in a position also needs improvement to facilitate staff availability. Staff turnover can also be a significant problem, as the same individuals are not involved in different plan revisions, a topic discussed in 5.1. New members of the staff may have less time to devote to additional activities like planning because they are becoming oriented to their new positions. They also devote time in order to become acquainted with responsibilities like hazard mitigation planning those vacating the position may not have been forthcoming with such information. This can be a result of the circumstances surrounding the position's vacancy. If the departing individual quit or was fired, accurate records may not have been kept, leaving a level of uncertainty for the incoming individual. It would be helpful for the departing individual to note the position's unwritten responsibilities, no matter how infrequent, on a consistent basis and not just at the end of their tenure.

If there is motivation within staff members to conduct the plan, it is best to schedule the meetings as close as possible, holding individuals accountable for attending the meetings in order to make considerable progress. When one community was severely impacted by Hurricane Irene, they began hazard mitigation planning soon after the event. They had frequent meetings, but as time passed, the meetings became less frequent. Other day to day responsibilities began to hold

more of their attention, meaning that the committee no longer actively worked on their hazard mitigation planning. It appeared that interest waned as time passed, and the event was no longer in the forefront of the community's mind.

5.4 Staff and Community Perception

Hazard mitigation plans are sometimes viewed as less important than they should be in communities. Our literature showed that one potential barrier to the creation of these plans was a low priority for most staff members. Our findings confirmed that towns view urgent problems as the most important priority a majority of the time. As a result, other important topics, like hazard mitigation planning, are ignored. Taking preventative measures for natural hazards is important, but because there is no way to determine when a hazard will occur and the timeline associated with the planning process is long, people tend not to think about hazards until they have already occurred.

5.4.1 Discussion

Full time staff members are the main parties responsible for creating a hazard mitigation plan. However, the plans are an additional responsibility given to staff members on top of their full time responsibilities. As a result, it becomes harder for the committee to get together and meet often. When they do, it takes a few weeks to set up a meeting date. Having extra staff members for the planning process is something that all of the interviewees thought would be helpful. However, hiring staff just for the hazard mitigation plan is not a realistic option as the plan is only updated every few years. Though a lot of work is associated with the update of the plan, there is not enough work for an individual afterwards.

As a result of the staff's extra work load, they have a difficult time prioritizing hazard mitigation planning. Many of the officials' other responsibilities are more pressing to the town than the hazard mitigation plan. Since creating the plan is not a simple or quick task, it often falls to the wayside. This can cause problems if they rush to complete it or take too long to finish it because they feel it is not as important. This causes confusion among the staff regarding which committee member is responsible for specific items, which we did not anticipate while creating our original barrier list. Since the staff has other responsibilities, the momentum sometimes slows down, and it may be hard to determine who should start the planning process back up. With this kind of situation, the roles of the committee members need to be better defined to make the process run smoother and more efficiently.

The town itself also holds a lot of other matters above pre disaster mitigation planning. Most citizens don't think about hazards or how to prevent them until they actually experience one, and so they do not push to have anything done. This finding lined up with what we found in the literature about citizens that are unaware of the benefits of planning but don't consider it until they are directly affected by a hazard. However, once a major storm hits, people start to push town officials to ensure that they are better prepared for the next storm. In some cases, this can be a good thing. Whereas planning beforehand is better, a small hazard can give people the push they need to start preparing for bigger ones.

5.4.2 Recommendation

Consultants are useful tools for hazard mitigation committees when the staff experiences a lack of time or motivation. If a town has the money to hire a consultant, the consultant can be a great asset for quickly pushing the plans forward. However, many towns do not have the funds to hire one. One way to overcome the cost may be for FEMA or MEMA to provide staff whose sole responsibility is to help towns make plans that the towns can employ as consultants for a smaller fee then consultants from private firms. This will give the towns more incentive to seek outside help instead of handling the plan in house.

Many times the staff lacks motivation to work on these plans. The cause can be that either staff members have other, more urgent matters to attend to, or because of the long timeline and uncertainty associated with the hazards. In these cases, it is helpful to have citizens or staff members who are willing to push the issue in order to encourage the committee to finish the plan. In our literature review, the National Oceanic and Atmospheric Administration (NOAA) suggested that having this kind of public support was effective in motivating the staff to complete the plan. If the towns or MEMA can raise awareness of the potential risks associated with not having a hazard mitigation plan among the citizens and staff, they may be able to motivate the committee to raise hazard mitigation planning as a priority.

5.5 Importance of Coordination and Communication

Having good relationships within the hazard mitigation committee and between the town and governmental agencies helps to make the planning process easier. If the committee members have a good working relationship and similar goals amongst themselves, they will be better able to effectively solve problems in a short amount of time. Similarly, if the town officials have

connections with personnel in governmental agencies such as FEMA, MEMA, MasDEP or the Army Corp of Engineers, it will be easier to obtain advice, data, funding, and help with creating the plan.

5.5.1 Discussion

In all the towns we visited, the interviewees stated that their committee members worked well together. In our literature review, we found that a significant barrier to planning was disagreements between committee members on priorities. However, our results showed that in the towns we visited, the members all agreed on the priorities of the plan. Our results may not match with the literature because of the small sample size of our analysis. While communication was not a problem in the towns we studied, it does not mean that it should be dismissed as a possible barrier for other communities on the Massachusetts coast.

Besides having good relationships within the town, it is also important for towns to establish stable communications with governmental agencies. In our research we found that towns are sometimes under the jurisdiction of government agencies such as the highway department, environmental agencies, or historical agencies, which corresponded to what we learned from our interviews. When towns have had disagreements or conflicts with these agencies, it strains their relationship and creates more difficulty when working with them on future projects. This happens as a result of the towns and agencies developing bad reputations with each other. This could affect their relationship even after the departure of the staff members who experienced the conflict. In order to keep a good relationship with agencies, it is important to keep in contact with the agencies and keep them involved in the community, even when the town does not need them for a grant or project proposal. This finding was also supported by the literature, which stated that when agencies are interested in a community, they are more likely to push for action and therefore motivate the community.

5.5.2 Recommendations

Having disconnect and information gaps between departments can affect the planning process. If the committee members are not aware of the problems in each of their departments, they may not be able to create the most informed and effective solutions to hazards within the plan. In order to remove the disconnection between the town departments, there needs to be a centralized board that overlooks all of them. This board would need to take a large active part in organizing the data from all the departments and providing information about the projects that

the others are doing. It would also be useful for the centralized board to hold meetings involving representatives of all the departments to keep each other up to date.

Having a poor relationship with government agencies can also have a negative effect on creating a hazard mitigation plan. In order to establish a good relationship it is useful to keep the agencies involved in the town. One way this can be done is by having members of the agencies come and speak about what they are interested in doing as an organization to the staff, the citizens, or both. Allowing the agencies to talk to the town like this will establish a connection between them that will be invaluable when the town begins planning. When working with these agencies, towns should also try to compromise as much as possible when disputes arise so as not to gain a reputation as being difficult.

5.6 Climate Change

One part of our project goal was to identify barriers and facilitators to including climate change in hazard mitigation plans. Limited staff time and availability as well as its optional inclusion made it a low priority for all of our case studies. Though it would have been beneficial to interview individuals in towns whose plans did explicitly include climate change, this was not the situation for any of the towns that participated in our study.

5.6.1 Discussion

In the literature review, we identified increasing storm frequency and severity, sea level rise, and flooding as problems stemming from climate change. A few interviewees noted the recent increases in storms that have been affecting their area, though they did not explicitly attribute this to climate change. A majority of interviewees mentioned flooding as a serious town problem. Though the literature contributed this partially to sea level rise, only a few of our interviewees mentioned it.

A couple of the subjects we interviewed mentioned some of controversy regarding the topic of climate change. Some people might not have brought up the issue or included it in their plans because climate change has been a popularly debated subject in the recent past and is not unanimously considered truth. Perhaps planners do not wish to press a potentially inflammatory issue when their main goal is to create a hazard mitigation plan. They would want a document that is straightforward in its intentions and does not have the appearance of having a political bias, thereby sparking tangential debate. It may be possible to sidestep this issue by including considerations for climate change but not explicitly labeling them as such. Towns that were

discovered in our literature review did include a section devoted to climate change, though our case studies did not.

5.6.2 Recommendations

Since so many people we interviewed stated that they were unsure as to whether climate change was actually an issue, it would be beneficial to provide them with information regarding its existence. A campaign could be started to raise general awareness by interested parties, but it may be more important to educate committee members and other staff persons specifically, because climate change relates to their field of work. If members within the committee conflict on the issue, proponents on the committee could serve as educators for those who are less literate on the subject. However, the topic should be approached with care as it is such a controversial issue. Again, those with experience in hazard mitigation planning understand the need to consider climate change in such plans.

Many of the interviewees said that their priority regarding the plan was to ensure that they had the minimum requirements for the plan done. If MEMA made a requirement to include considerations for climate change, then communities would certainly be obligated to include them. If interest groups were particularly insistent on including climate change in the plans and could create enough community support, committee members would feel a certain sense of obligation to the address these concerns.

Of course it may not be necessary for every town to have a study done on their area, but perhaps it could be beneficial to have every town at least consider it. It would also be good practice for people in coastal communities to consider projected sea level rise when developing near water.

6. Conclusion

The goal of this project was to determine the barriers and facilitators to hazard mitigation planning for Massachusetts coastal communities largely through interviews with individuals that have practical knowledge about the planning process. We selected three case studies in order to capture a range of experiences while keeping the scope reasonable. Then, we familiarized ourselves with their hazard mitigation plans before contacting, scheduling and conducting interviews with individuals within these communities. Finally, we analyzed the interviews to determine those barriers and facilitators. The purpose of interviewing individuals with practical knowledge was to obtain first-hand accounts of their barriers and facilitators.

The purpose of determining these factors was to be able to provide that knowledge as well as our recommendations to communities and larger agencies, including FEMA and MEMA. Prior or during the planning process, communities and agencies will be able to identify these factors and attempt to avoid the barriers while enhancing the impact of facilitators. Our recommendations will hopefully aid in those attempts. Communities would hopefully disseminate their experiences and learned information to other communities to aid them in their planning processes as well.

This project helped provide some illumination into the factors that hinder hazard mitigation planning so communities will be able to dedicate additional effort and resources to climate change adaption. As a result of an already difficult planning process, climate change was a neglected topic within the plans because towns were more focused on just completing the hazard mitigation plan. This will prove to be a challenge in the future as the global climate is changing to produce more impactful and costly hazards. Just planning for those familiar hazards that towns have always experienced is not enough. Communities need to plan for hazards that are larger, more frequent, and most importantly, more destructive. Without proper hazard mitigation planning with considerations for climate change, the future is bleak for these communities as they lose lives and important infrastructure.

6. Bibliography

Ashton, A. D., Donnelly, J. P., & Evans, R. L. (2008; 2008). A discussion of the potential impacts of climate change on the shorelines of the northeastern USA. *Mitigation and Adaptation Strategies for Global Change, 13*(7), 719-719-743. Retrieved from http://ezproxy.wpi.edu/login?url=http://search.proquest.com.ezproxy.wpi.edu/docview/203688326?accountid=29120

Ballinger, R., Potts, J., Bradly, N., & Pettit, S. (2000). A comparison between coastal hazard planning in new zealand and the evolving approach in england and wales. *Ocean & Coastal Management,43*(10-11), 905-925. doi:10.1016/S0964-5691(00)00064-8

Berg, B. L. (2004). Chapter four: A dramaturgical look at interviewing. In *Qualitative research methods: For the social sciences* (5th ed., pp. 75). California State University, Long Beach: Pearson Education, Inc.

Bill McKibben. (2009). CLIMATE CHANGE. *Foreign Policy,* (170), 32.

Booz Allen Hamilton. (2010). *Hazard and resiliency planning: Perceived benefits and barriers among land use planners.* (Final Research Report 2234 South Hobson Ave. Charleston, SC 29405: NOAA Coastal Services Center. Retrieved from http://www.csc.noaa.gov/publications/Hazard-and-Resiliency-Planning.pdf

Brouillette-Jacobson, D. M. (2008). *Analysis of coastal erosion on martha's vineyard, massachusetts: A paraglacial island.* ScholarWorks@UMass Amherst).

Burby, R. J. (2001). Involving citizens in hazard mitigation planning: Making the right choices. *Australian Journal of Emergency Management, 16*(3), 45.

Burroughs, W. J., & Ebrary Academic Complete. (2001). *Climate change: A multidisciplinary approach*. New York: Cambridge University Press.

Butman, B., Sherwood, C. R., & Dalyander, P. S. (2008). Northeast storms ranked by wind stress and wave-generated bottom stress observed in massachusetts bay, 1990-2006. *Continental Shelf Research, 28*(10-11), 1231-1245. doi:10.1016/j.csr.2008.02.010

State Hazard Mitigation Plan, PlanU.S.C. (2010). Retrieved from http://www.mass.gov/?pageID=eopsterminal&L=4&L0=Home&L1=Homeland+Security+%26+Emergency+Response&L2=Hazard+Mitigation&L3=Planning&sid=Eeops&b=terminalcontent&f=mema_disaster_recovery_planning_and_the_state_hazard_mitigation_plan&csid=Eeops

Daniel A. Farber. (2007). ADAPTING TO CLIMATE CHANGE: WHO SHOULD PAY. *Journal of Land use & Environmental Law, 23*, 1-441.

Davidson, M., Krimm, R., Williams, S., Chesnutt, C., & Ward, S. (1999). Managing the impacts of coastal hazards. *Sea Technology, 40*(1), 65-68.

Day, C. (2004). Sea-level rise exacerbates coastal erosion. *Physics Today, 57*(2), 24-26.

Disaster Mitigation Act of 2000, Public Law 106-390
, Chapter 68, Title 42U.S.C. 5121 (2000). Retrieved from http://www.fema.gov/library/viewRecord.do?id=1935

Douglas, E., & Fairbank, C. (2011). Is precipitation in northern new england becoming more extreme? statistical analysis of extreme rainfall in massachusetts, new hampshire, and maine and updated estimates of the 100-year storm. *Journal of Hydrologic Engineering, 16*(3), 203-217.

Dupuis, J., & Knoepfel, P. (2011). Barriers to omplementation of adaptation policies to climate change: The case of switzerland. *SWISS POLITICAL SCIENCE REVIEW, 17*(2), 188-219. doi:10.1111/j.1662-6370.2011.02011.x

Encyclopaedia Britannica, i. (2009). Marblehead. In *Britannica concise encyclopedia* ()

Farber, D. A. (2007). Apportioning climate change costs. *UCLA Journal of Environmental Law & Policy, 25*(2), 21.

FEMA. (2008). *Local multi-hazard mitigation planning guidance.*

FEMA. (2010). *Hazard mitigation planning overview.* Retrieved October/7, 2011, from http://www.fema.gov/plan/mitplanning/overview.shtm

Florides, G. A., & Christodoulides, P. (2009). Global warming and carbon dioxide through sciences. *Environment International, 35*(2), 390-401. doi:10.1016/j.envint.2008.07.007

Frumhoff, P. C., McCarthy, J. J., Melillo, J. M., Moser, S. C., Wuebbles, D. J., Wake, C., & Spanger-Siegfried, E. (2008). An integrated climate change assessment for the northeast united states.*Mitigation and Adaptation Strategies for Global Change, 13*(5), 419-423. doi:10.1007/s11027-007-9138-x

Glavovic, B. C., Saunders, W. S. A., & Becker, J. S. (2010). Land use planning for natural hazards in new zealand: The setting, barriers, 'burning issues' and priority actions. doi:10.1007/s11069-009-9494-9

Godschalk, D. R., Brody, S., & Burby, R. (2003). Public participation in natural hazard mitigation policy formation: Challenges for comprehensive planning, journal of environmental planning and management. *Journal of Environmental Planning and Management, 46*(5), 733-733-754.

Haines, A., Smith, K. R., Anderson, D., Epstein, P. R., McMichael, A. J., Roberts, I., . . . Woods, J. (2007). Policies for accelerating access to clean energy, improving health, advancing development, and mitigating climate change. *The Lancet, 370*(9594), 1264-1281. doi:10.1016/S0140-6736(07)61257-4

Hallegatte, S., Henriet, F., & Corfee-Morlot, J. (2011). The economics of climate change impacts and policy benefits at city scale: A conceptual framework. *Climatic Change, 104*(1), 51-87. doi:10.1007/s10584-010-9976-5

Local Natural Hazards Mitigation Plan, PlanU.S.C. (2007).

Hansen, J., Mki. Sato, R. Ruedy, K. Lo, D.W. Lea, and M. Medina-Elizade. (2006). Global temperature change. *Proc. Natl. Acad. Sci., 103*(39), 14288. doi:10.1073/pnas.0606291103

Henson, R. (1995, December; 2011/9). Hurricanes in disguise.*48*(6), 12+. Retrieved from http://go.galegroup.com/ps/i.do?&id=GALE%7CA17878981&v=2.1&u=mlin_c_worpoly&it=r&p=AONE&sw=w

Himmelstoss, E., FitzGerald, D., Rosen, P., & Allen, J. (2006). Bluff evolution along coastal drumlins: Boston harbor islands, massachusetts. *Journal of Coastal Research, 22*(5), 1230-1240. doi:10.2112/06A-0005.1

Holgate, S., & Woodworth, P. (2004). Evidence for enhanced coastal sea level rise during the 1990s. *Geophysical Research Letters, 31*(7) doi:10.1029/2004GL019626

July is 'hurricane preparedness' month in massachusetts. (2007). Retrieved September 22, 2011, from http://www.mass.gov/?pageID=eopsmodulechunk&L=3&L0=Home&L1=Public+Safety+Agencies&L2=Massachusetts+Emergency+Management+Agency&sid=Eeops&b=terminalcontent&f=mema_feature_story_2007_feature_stories_2007_july_is_hurricane_preparedness_month&csid=Eeops

Kansas tornado information. (2012). Retrieved 02/21, 2012, from http://www.crh.noaa.gov/gld/?n=kansas.html

Kirshen, P., Knee, K., & Ruth, M. (2008). Climate change and coastal flooding in metro boston: Impacts and adaptation strategies. *Climatic Change, 90*(4), 453-473. doi:10.1007/s10584-008-9398-9

Kirshen, P., Watson, C., Douglas, E., Gontz, A., Lee, J., & Tian, Y. (2008). Coastal flooding in the northeastern united states due to climate change. *Mitigation & Adaptation Strategies for Global Change,13*(5), 437-451. doi:10.1007/s11027-007-9130-5

Lee, J., Paul, C., & Selvaduray, G. (2009). *BARRIERS TO MITIGATION: A PILOT STUDY.* San Jose CA: Collaborative for Disaster Mitigation San José State University. Retrieved fromhttp://www.sanjoseca.gov/Emergencyservices/pdf/MitigationReport.pdf

Leichenko, R. (2011). Climate change and urban resilience. *Current Opinion in Environmental Sustainability, 3*(3), 164-168. doi:10.1016/j.cosust.2010.12.014

M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden, & C.E. Hanson. (2007). **Climate change 2007: Impacts, adaptation and vulnerability**. *IPCC,* , September 24, 2011.

Marblehead: Visiting and town history. (2010). Retrieved January 11, 2012, from http://www.marblehead.org/index.aspx?NID=10

Meghan Bond. (2010). Localizing climate change: Stepping up local climate action. *Management of Environmental Quality: An International Journal, 21*(2), 214-225. doi:10.1108/14777831011025553

MEMA. (2009). *Mitigation in massachusetts - 2009 overview.* Boston MA: Massachusetts Emergency Management Agency. Retrieved from http://www.mass.gov/Eeops/docs/mema/disaster_recovery/mitigation/2009_best_practices.pdf

Mitigation planning fact sheet (2010). FEMA.

Moser, S. C., & Ekstrom, J. A. (2010). A framework to diagnose barriers to climate change adaptation. *Proceedings of the National Academic of Sciences, 107*(51)

NOAA. (2011). ***Over half of the american population lives within 50 miles of the coast.*** Retrieved, 2012, from http://oceanservice.noaa.gov/facts/population.html

O'Neill, J. (December 14, 2009). ***Chronology of westport history 1500 – present.*** Retrieved, 2012, from http://www.westporthistory.com/news/archives/000467.html

Osburn, T. W. (2008). *Hazard mitigation and disaster preparedness planning at american coastal university: Seeking the disaster resistant university.* (Unpublished Doctor of Education). University of North Texas, Retrieved from http://digital.library.unt.edu/ark:/67531/metadc9745/

Pine, J., & ENVIROnetBASE. (2008). *Natural hazards analysis: Reducing the impact of disasters*. Florence: Auerbach Publishers, Incorporated.

Pradin, B. (2011). *Marblehead: History timeline.* Retrieved January 11th, 2012, from http://www.legendinc.com/Pages/MarbleheadNet/MM/Articles/Timeline.html

Reddy, S. D. (2000). *Examining hazard mitigation within the context of public goods.* (Profile Denton, Texas 76203-0919, USA: Institute of Emergency Administration and Planning and Department of Public Administration University of North Texas. doi:10.1007/s002679910010

Rigden,Damien K Student author -- ME, Rheault,Courtney L Student author -- CE, DiTroia,Lisa Marie Student author -- BE, Beasley,Michael Student author -- BE, Tuler,Seth Faculty advisor -- ID, & Addison,William A.B.Faculty advisor -- HU. (2007). *Tsunami mitigation in ban nam khem, thailand -- assessment of evacuation towers, the warning system, and education and training*. Worcester, MA: Worcester Polytechnic Institute.

Roads, S.,the younger. (1881). *A guide to marblehead*. United States:

Roads, S.,Jr. (1890). *A guide to marblehead*. United States:

Robert O. Schneider. (2002). Hazard mitigation and sustainable community development. *Disaster Prevention and Management, 11*(2), 141-147. doi:10.1108/09653560210426821

Salisbury beach visitor's guide. (2011). Retrieved 01/25, 2012, from http://www.salisbury-beach.org/

Hazard Mitigation Plan 2011 Update, PlanU.S.C. (2011). Retrieved from http://www.saugus-ma.gov/Pages/SaugusMA_BBoard/I030F9966

Schneider, R. O. (2002). Hazard mitigation and sustainable community development. *Disaster Prevention and Management, 11*(2), 141-147. Retrieved fromhttp://search.proquest.com/docview/214379142?accountid=29120

Smith, S. M., Abed, R. M. M., & Gercia-Pichel, F. (2004). Biological soil crusts of sand dunes in cape cod national seashore, massachusetts, USA. *Microbial Ecology, 48*(2), 200-208. doi:10.1007/s00248-004-0254-9

Town of Salisbury Massachusetts.*History.* Retrieved 01/25, 2012, from http://www.salisburyma.gov/hist.html

Hazard Mitigation Plan, planU.S.C. (2011). Retrieved from http://www.saugus-ma.gov/pages/SaugusMA_BBoard/I030F9966

Hazard Mitigation Plan 2011 Update, (2011). Retrieved from http://www.saugus-ma.gov/Pages/SaugusMA_Fire/4_21_11%20DRAFT%20Saugus%20PDM.pdf

United States Global Change Research Program. (2007). *National climate change.* Retrieved, 2012, from http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/full-report/national-climate-change#key3

US Census Bureau. (2010). *Fact finder 2.* Retrieved, 2012, from http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

Voyer, R., Pesch, C., Gather, J., Copeland, J., & Comeleo, R. (2000). New bedford, massachusetts - A story of urbanization and ecological connections. *Environmental History, 5*(3), 352-377.

Appendix A

Interview Guide

Interviewee Details
1. What is your role in the community?
2. What is your part in the hazard mitigation planning process?
3. What hazards do you find most pressing?
   a. Do you find these are getting worse with the changing global climate?
4. How do you plan for the hazards?

Community Details
5. What are the major hazards that affect [your town]? How many do you believe are related or will worsen due to climate change?
6. How often does your town make/revise plans?
7. How important do people in [your town] think hazard planning is? How important is it to you?
8. Have you included climate change considerations in your plans?

Barrier and Facilitators Topics
9. What problems have you found when working on [your town's] hazard mitigation plan?
10. How much data do you have and is it sufficient for your needs?
11. What databases are available to you for the information you need to make decisions about the plan?
12. How difficult is it to create plans and meet as a committee?
13. How you ever experienced a disconnect when working with town planners/other departments/the public/politicians?
    a. If so, what do you think that disconnect is caused by? (eg. Political, ideological, lack of interest?)
14. Are you limited by a budget? What are the causes of the limitations? What has been sacrificed for them?
15. Is your town receiving/looking at any sort of government grants or aid for hazard planning?
16. What other barriers or challenges do you face when trying to plan?
17. What are other ways your group has overcome or will be attempting to overcome these barriers?