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Disaster Decision Making:

Hurricanes Katrina and Gustav in New Orleans

An Interactive Qualifying Project Report
submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfillment of the requirements for the
Degree of Bachelor of Science

By

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<u>Abstract</u>

The goal of this project was to set standard criteria for evaluating the execution of a disaster response at the local, State, and Federal Government levels. This evaluation, which was based on the disaster responses to Hurricanes Katrina and Gustav, focused on improvements in decision making. This project's procedure consisted of developing a model of decisions made and analyzing them. It was determined that there is a need for competent leadership, conducting rehearsals, and more initiative at all government levels.

Authorship Page

All Group Members contributed equally to:

- Project Proposal
- Section Introductions
- Analysis Framework
- Final Analysis

Adam Cartier contributed primarily to:

- Introduction
- Background
- Rehearsals and Drills
- National Guard

Craig Laprade contributed primarily to:

- Choosing Presentation Medium
- Choosing Software Package
- Website Development
- Website Descriptions and Operating Instructions
- Plans Development
- Federal Military
- FEMA

Michael Pierri contributed primarily to:

- Development of the Model
- Abstract Development
- Model Description
- Evacuation Planning
- State Government
- Federal Government
- Hurricane Katrina Model Test
- Hurricane Gustav Model Test

David Worsham contributed primarily to:

- Abstract
- Organization of Material - Model
- Criteria for Evaluating Model
- Protective Systems
- Local Government
- Conclusions
- In Retrospect

0.1) Table of Contents

0.2) Table of Graphics and Figures

0.3) Table of Tables

1.0) Introduction:

Disaster management encompasses overseeing and controlling the planning, preparation, execution and recovery of a disaster that occurs. Depending on the type of event, there may or may not be advanced warning. Certain events are deliberately or accidentally caused by humans dealing with developed technology, while others are caused naturally by the environment.

Natural disasters are caused by a natural hazard, such as a hurricane or earthquake, but the magnitude of their damage can be mitigated by the ability of the populace and government to prepare for and control the situation, thus limiting the consequences of the destruction. How to prepare is a significant undertaking that requires interactions amongst government officials at all levels to be successful. A lack of planning, improper management, insufficient financial support, and miscommunication are only a few things that can be improperly managed and therefore result in higher civil and human loss.

The general policy for disaster planning and response within the United States has relied heavily on the ability of the local government to first act without support. Then, when the situation became too large to manage or their resources were depleted, they are able to request the assistance from their state and Federal government (Federal 2006).The way in which any level of government responds to a disaster is basic in principle: first deploy first responders in to the disaster area to rescue any victims of the disaster, then stabilize the area from additional damage while addressing the level of initial damage. While the concept is simple, the execution brings with it many problems and concerns that may not be immediately apparent. For example the response requires a tremendous amount of manpower, the organization of which can be overwhelming. Yet an unforeseen problem that may arise is the ability to provide nourishment and housing for all those who are displaced as well as the rescuers in a disaster area. Many of the

actions and decisions that occur after a disaster need to occur rapidly or loss of life and property can increase exponentially. Understanding how the emergency response system set in place by local, state, and Federal governments works can be a daunting task. While the first responders from the fire, police, and medical services along with the help from the National Guard may be the most visible in rescuing and securing the victims, there are many layers to it that run in the background, invisible to the public eye but equally important to its operation. After being removed from physical harm the victims need support of a different kind. Organizations involved such as the Red Cross and the Adventist Community Service provide clothing, bedding, and food as well as temporary housing, while other volunteers give money and provide counseling to help the victims deal with the financial loss and emotional damage.

This goal of this project is to define a standard model that can be followed for evaluating a successful disaster response assuming the role of local, state, and Federal governments. To accomplish this goal the project takes into account the following criteria:

- The decisions made at the local, state, and federal government levels as well as the criteria for those decisions

- The use and management of available resources and their capabilities

- The escalation command, authority, and responsibility of all leadership entities

- Interaction between government entities as well as their interactions with the private sector.

In order to complete this analysis, the model evaluates disaster management in two different groups. These groups include the planning group, which is comprised of the actions to take place in preparation for a disaster, as well as the government group, consisting of the leadership and their decisions during and after the disaster. Overall a successful disaster

management policy will reduce the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery. In the end this model will assist in understanding and assessing the actions that have been taken in response to past disasters to better prepare and adapt for the future.

2.0) Background:

2.1) Hurricanes

Hurricanes are described as an oceanic cyclone that develops over the warm tropical water with sustained winds exceeding 74 miles per hour (Barry, 2001). They are born from complexes of thunderstorms and grow to hurricane strength under the right conditions between the ocean and the atmosphere. There are generally six favorable conditions that need to be met for a Hurricane to form:

- Warm water of at least 80°F to about 50m depth
- An atmosphere that cools considerably with height
- Moist layers of middle atmosphere for the creation and support of thunderstorms
- Be a distance of 300 mi from the equator for the Coriolis force to take enough of effect
- Low wind Shear (Landsea, 2001)

The presence of the above conditions does not guarantee that a hurricane will form. Hurricanes require that the water be above 80° F and the atmosphere to have a high humidity; it is this heat energy and humidity that actually drive the storm system. The Thunderstorms from which hurricanes form release latent heat as water evaporates, increasing the air temperature and causing the air to rise. As it rises, colder air rushes underneath and wind speed increases. The cold air rushing in will be deflected perpendicular to its velocity by the Coriolis acceleration, a result of the rotation of the earth that makes airflows not only flow from high to low pressure but easterly or westerly in direction, thus creating the spinning storm (Baum, 1997).

From birth to death hurricanes go through an unpredictable life cycle. It can take anywhere from a matter of hours to days for a tropical disturbance to develop into a hurricane, if at all (Bramer, 1999). Many of the storms that pass through the tropical waters of the Caribbean lose power before they reach land. The ones that do reach hurricane strength follow similar

cycles of development. The first stage occurs with the formation of an area of disturbed weather, also known as a tropical disturbance. As the thunderstorms gather and the storm becomes larger it can turn into a tropical depression, characterized by a lower pressure and organized circulation in the center of storms. As the wind speeds increase to between 39 mph and 74 mph, the storm system is given a name and becomes a tropical storm. Finally once the winds are sustained above 74 mph, it is officially a hurricane (Brian, 2005).

Hurricanes have a reputation for damage that comes from the various aspects of the storm. They deliver massive downpours of rain in a relatively short amount of time that creates flooding. In addition, the high wind speeds when sustained can cause structural damage to manmade structures as well as natural terrain features, such as trees. These winds also push water toward the shore, creating a drastic rise in the water levels which is referred to as the storm surge. The storm surge can cause even more significant flooding by raising the water level in coastal areas. It is the storm surge, or raise in ocean water, that has historically resulted in the most hurricane related damages and casualties (Shultz, 2005).

Table 1: Saffir-Simpson Hurricane Scale

Category	Wind Speed mph | kph	Storm Surge ft | meters	Damage
1	74-95 | 119-154	4-5 | 1.2-1.5	Some flooding; little or no structural damage
2	96-110 | 155-178	6-8 | 1.8-2.4	Coastal roads flooded; trees down; roof damage (shingles ripped off)
3	111-130 | 179-210	9-12 | 2.7-3.7	Severe flooding; structural damage in houses and mobile homes destroyed
4	131-155| 211-250	13-18|3.9-5.5	Severe flooding inland; some roofs ripped off; major structural damage
5	>155 | >250	>18 | >5.5	Severe flooding farther inland, serious damage to most wooden structures

Table 1 shows the various categories of hurricanes as defined by the Saffir-Simpson Hurricane scale developed in 1971 by Civil Engineer Herbert Saffir and meteorologist Bob Simpson (Williams, 2005). The chart shows the differences in speed as well as the associated storm surge, or rise in water level. Finally the kinds of damages to be expected under each category are listed.

2.2) Hurricane Katrina

Hurricane Katrina was the fifth hurricane of the 2005 season. It began as a tropical depression on Aug 23, 2005. Within a day it had progressed to a tropical storm and was on its way to crossing southern Florida. By August 25th it had grown to full hurricane strength and continued on its path until finally making landfall in Louisiana, Mississippi, and Alabama on August 29th (Knabb, 2005). Figure 1 shows the path of Hurricane Katrina. Katrina was one of the worst hurricanes in United States History. The storm caused severe destruction in the Gulf ranging from Florida to Texas, with the majority of the damage resulting from the storm surge.

When Katrina hit, the greatest damage occurred in New Orleans, Louisiana. As only the half the city is located above sea level it relied heavily on floodwalls to protect it from the storms that were characteristic of that region, with a hurricane hitting or brushing Louisiana a little less than once every 4 years (Neely, 2008). Figure 2 shows a cross section of the ground New Orleans is built upon in relation to the ocean's water level. After Hurricane Betsy in 1965, Congress passed the Flood Control Act of 1965, which gave control of the flood protection in the New Orleans area to the US Army Corps of Engineers. This project, which included the construction of control structures and concrete flood walls, was expected to take about 13 years to complete, but was delayed and only about 80% done at the time of Hurricane Katrina (Barge,

2005). On August 29th, 2005 the partially completed floodwalls finally gave way, with many

collapsing below stated thresholds. The failure of these floodwalls has been called one of the

greatest engineering disasters of US history (Anderson, 2007).
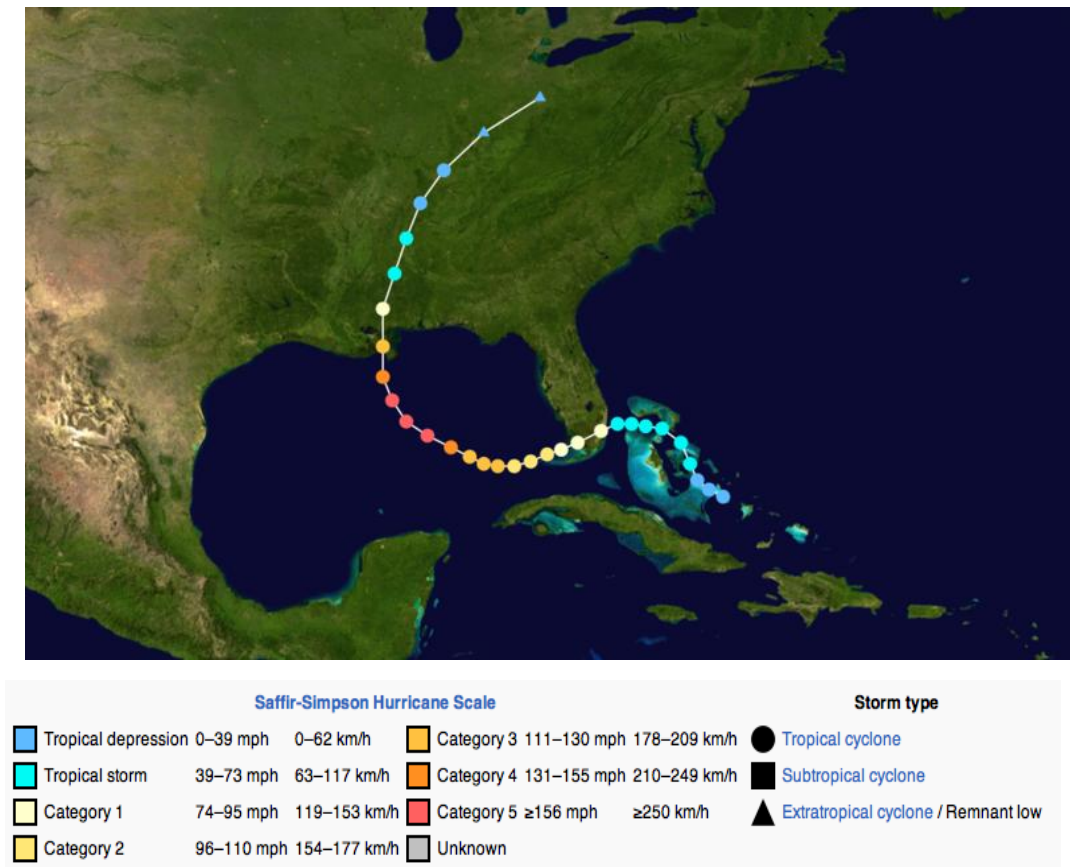
Figure 1: Path of Hurricane Katrina

Prior to the storm there were predictions of a possible hurricane heading towards New

Orleans. The national weather service had been tracking the tropical depression and released a

bulletin on August 28th that stated there would be major damage to the New Orleans area, the

same day New Orleans Mayor Ray Nagin issued a mandatory evacuation order, stating that the Hurricane would likely "[...] topple the levee system"(Anderson, 2007). Besides those willing and able to leave New Orleans, there was no plan set in place for the elderly, the infirmed or those without a vehicle.

The results of the storm were massive. Katrina's storm surge led to over 50 levee breaches in the federally built levee system protecting New Orleans, leaving 80 percent of the city under water. Two thirds of that overflow was the result of these breaches in the flood protection system, while one third was due to the high rains of the storm (National Weather Service, 2006). The total damage is estimated at $81.2 billion in property damage, with reports of 1,464 deaths from Louisiana residents and 346 victims reported by other states (Reports, 2006)(Sheikh, 2005). It is important to note that this amount doesn't include the damage done to the economy due to the shut down and damage to oil rigs in the Gulf, the damage to the interstate highway structure (limiting all traffic in and out), and the loss of electricity and other natural resources. The environment itself was also hit hard, causing beach erosion, loss of forestry and breeding grounds, as well as a contaminating the water that filled the streets with sewage, bacteria and other toxic chemicals (Sheikh, 2005).
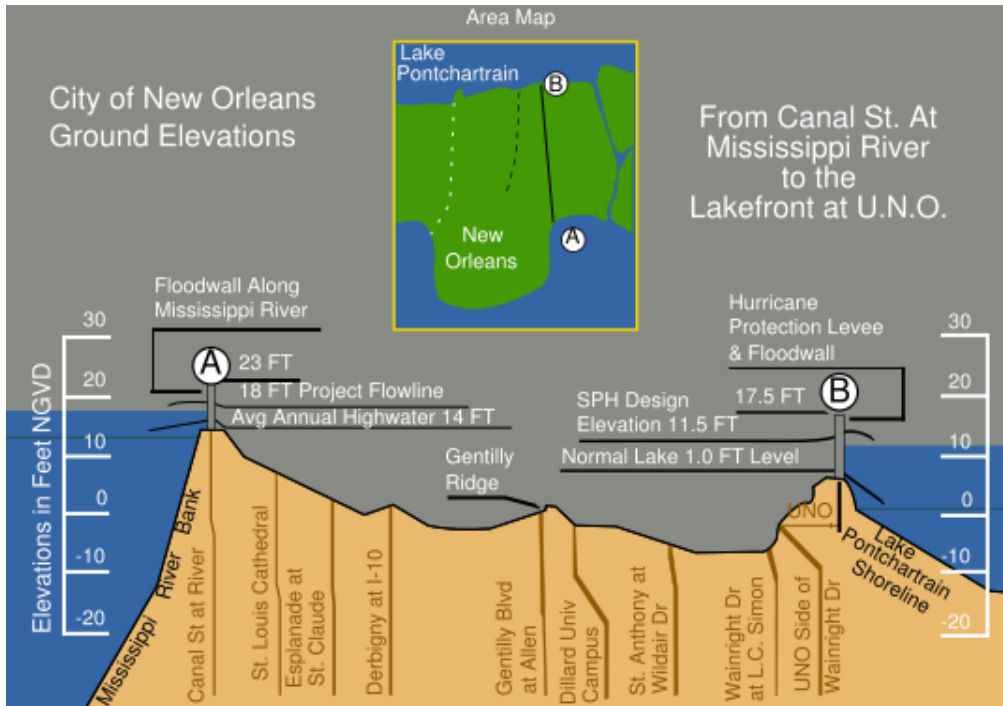
Figure 2: Cross Section of New Orleans (Katrina)

Important to this investigation was the criticism of the mismanagement of the response to Hurricane Katrina as well as a lack of leadership. More specifically, the delayed response to the flooding was investigated. Much of this frustration seems to be a result of the media portrayal of the visible lack of confidence in the political leaders and the pictures and videos of the damage and those still stranded in the flood waters without basic necessities days after the storm. Other critics claim that race and social standing had an effect on the rescues, including celebrity Kanye West. During a telethon he stated that the government was lacking in response in areas where the individuals being affected were of "African America" descent. He finished up his dialogue with the statement "George Bush doesn't care about black people!" As a result of the lack of leadership, delayed response, lack of confidence, and negative media attention, there was much turmoil in the aftermath of Katrina.

2.3) Hurricane Gustav

The third hurricane of the 2008 season brought serious damage to the area of the

Caribbean and the United States, though not nearly to the effect of Hurricane Katrina. It had

formed as a tropical depression in the Caribbean near Haiti on August 25th and continued on its

path, rapidly strengthening to a tropical storm and then a category 4 Hurricane the following day.

It weakened with a high wind shear, and three years and three days after the landfall of Hurricane

Katrina in Louisiana, Hurricane Gustav made contact with the United States near Cocodrie,

Louisiana with sustained winds of 110 mph (Cat 2 Hurricane) (Belvin, 2008). Figure 3 illustrates

the path of Hurricane Gustav.

Saffir-Simpson Hurricane Scale   **Storm type**

Tropical depression 0–39 mph 0–62 km/h	Category 3 111–130 mph 178–209 km/h	● Tropical cyclone
Tropical storm 39–73 mph 63–117 km/h	Category 4 131–155 mph 210–249 km/h	■ Subtropical cyclone
Category 1 74–95 mph 119–153 km/h	Category 5 ≥156 mph ≥250 km/h	▲ Extratropical cyclone / Remnant low
Category 2 96–110 mph 154–177 km/h	Unknown	
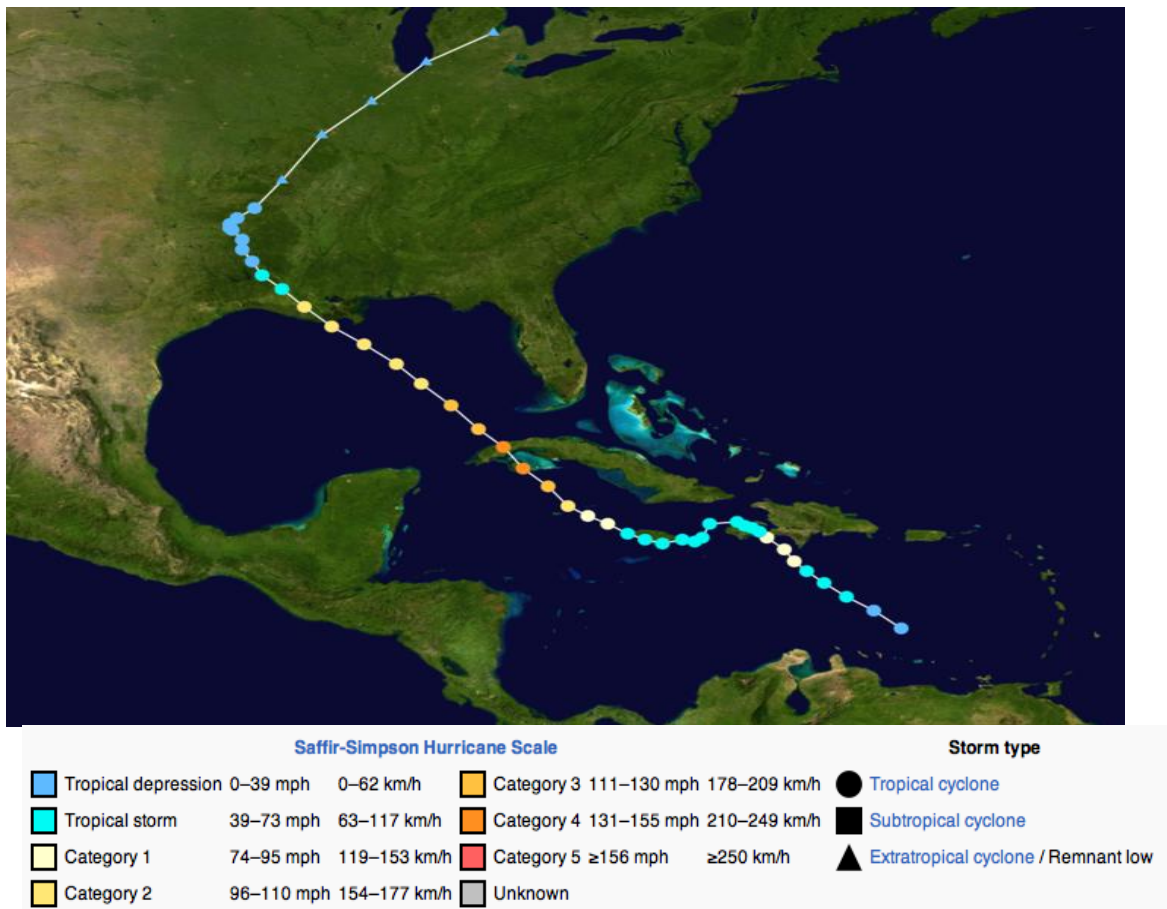
Figure 3: Path of Hurricane Gustav (Reuters, 2008)

Hurricane Katrina on a large scale. Fearing a repetition of Hurricane Katrina and the fact that the National Hurricane center gave a 45 percent probability that Gustav would keep its strength as a Category 3 Hurricane, almost two million people fled the coastal areas in danger of being hit, making this the largest evacuation in Louisiana History (Lyons, 2009). These evacuations began on August 29th, with contra-flow traffic lanes being used to ease the travel (all lanes reversed to one direction). By September 1st there were estimated to only be 10,000 people, of an initial population of 290,000, left in the city of New Orleans, with those requiring transportation having it provided for them. (Braun, 2008).

As a result of the lack of execution and damage caused by Hurricane Katrina three years prior, many deficiencies were found in the disaster management process. Changes were made and far less damage was endured from Hurricane Gustav. Louisiana and the United States sustained about $4.3 billion dollars of damage and the storm was blamed for 25 fatalities in the U.S (Anderson, 2008). By September 4th, New Orleans had reopened and crews had restored most of the power and other services. Most of the damage from this storm had come from the high winds and some localized flooding caused by heavy rainfall. This time the levees and other flood preventative measures had worked as the high water from the storm surge had splashed over the floodwalls onto the splashguards, but did not compromise them (Braun, 2008).

Comparatively, the response to Hurricane Gustav was far quicker and more efficient than the response to Hurricane Katrina. There were far less complaints and physical damage. There was order that was maintained throughout the storm, as well as contingency plans in place for those who couldn't move themselves out. Overall the government did a better job of serving the people than before.

2.4) Disaster Response

In order to prepare and provide an organized response at all government levels to disasters and emergencies the United States had developed various guidelines to follow. These guidelines integrated all of the available resources of the private sector as well local, state, and federal government into a unified structure. It also established procedures to help protect the public health, safety and property, while reducing the amount of environmental and mental anguish of victims.

At the time of the landfall of Hurricane Katrina the United States national plan to respond to emergencies such as natural disaster was the National Response Plan (NRP). It consisted of a few all-inclusive sections that included: a base plan, appendixes, emergency support function annexes, support annexes, and incident annexes (Fact, 2005). Each of these sections covered different parts of the overall plan from roles and responsibilities of all involved in the incident management process to definitions and group capabilities. Within the NRP there was an emphasis on local response that identified police, fire, public medical, emergency management and other personnel as the ones responsible for incident management at the local level (Fact, 2005). The NRP was actually designed for incident response to be handled at the lowest possible jurisdictional level, while allowing for the delivery of federal support in response to catastrophic incidents when requested by the local government or deemed necessary by the federal government (Fact, 2005). In the event of large-scale disaster the United States Department of Homeland Security was to oversee the NRP, assuming responsibility for the preparedness at all levels (Preparedness, 2009). This plan was updated after the 2006 hurricane season, but eventually replaced by the National Response Framework in 2008.

The National Response Framework (NRF) was in place when Hurricane Gustav had formed and made landfall on the United States. Besides the new name the NRF has changed the

way the nation will conduct incident response. The National Response Framework has the same

goals as the NRP but is built on five different key principles:

- Engaged Partnerships
- Tiered Response
- Scalable, flexible and adaptable operational capabilities
- Unity of effort through unified command
- Readiness to act (National, 2008)

There is an expanded focus on partnerships which stresses "layered, mutually supporting

capabilities" between the individuals, local government, and state governments (Goes Live,

2009). While the local government is still responsible for much of the disaster management, they

must concentrate on developing cooperative relations with surrounding areas and those in the

private sector. The addition of a more thorough planning section also increases the readiness to

act, allowing a more seamless transition to the execution phase. The NRF also provides clearer

terminology, roles and responsibilities and more in depth guides for response partners,

decreasing the chance of an error due to misinterpretation (Goes Live, 2009).

      While the NRP and the NRF were addressed to the same leaders and have relatively the

same data and instructions, the NRF has improved where the NRP had fallen short in the past. It

is a streamlined document that is shorter and user-friendly, eliminating much of the bureaucratic

red tape, and allowing the local leaders to request the help they need. This evolution came from a

need that became apparent after the lack of response to Hurricane Katrina, it reflects the

evolution and improvement of the national response structure.

2.5) Summary

      Clearly there are a number of different forces of nature that create damage that will need

to be managed by a form of government leadership. Each type of force of nature, be it a

hurricane, earthquake, or volcanic eruption to name a few, have separate dangers. By researching

the capabilities of each force of nature, it becomes possible to apply the framework for

successful disaster management by understanding what potential impacts all levels of

government have to plan for. This research is essential to the analysis of the disaster management

of Hurricane Katrina and Hurricane Gustav.

3.0) Project Methodology:

3.1) Introduction:

In this chapter, the methods that were used during this project will be discussed in regards to: the development of the model, choosing the software package, the criteria for evaluating the material, the organization of the material, the choice to use a website to deliver the collected material, the subsequent development of the website, and the development of the topic abstracts. Through the following sections, the reader should develop an understanding of what was done through this project and how it was done.

3.2) Development of Model

The development of a model was a key goal during the early stages of the project. The objective was to model an advanced warning natural disaster in a broad sense. The intended audience of the model was decision makers, planners, and future IQP groups. The team wanted to avoid narrowing in on a specific type of event or specific occurrence, but came to the conclusion that an event has different actions depending on whether or not information is available about it before the event occurs.

For the first stage of development there were no constraints or a suggested format. Several models were created individually without a discussion among the team members. The project team then compared the individually developed models and reviewed the thought process outlined in each one. The models were eventually categorized into two groups based on coincidental correspondence. The first grouping included the models that contained elements of a decision making flow chart (Figure 4) that went through the process of receiving notification

through the recovery effect of a natural disaster, while the second grouping modeled the effects that accompany a natural disaster.

The next stage of development involved merging the models that were in each category. The team members who were responsible for the initial development of the models were also responsible for the merging process of their individual models. The project team continued the project working off of the two merged models. The strategy was to retain the two models until the project team was able to finalize the scope and direction of the project. The project team tested the models against various examples during the development process by posing examples of disasters or following the flow of past disasters and seeing if the flow of information in their model corresponded.

To narrow the scope of the project, the project team chose to only continue with the government effects model as the only model because it most closely replicated the direction that the project was moving towards focusing on decision making. (Figure 5) This model remained almost the same throughout the rest of the project until the project team decided to further narrow down the model and cut out a portion of it.

(To see the final model and a more detailed description of it, go to section 4.2-4-3)
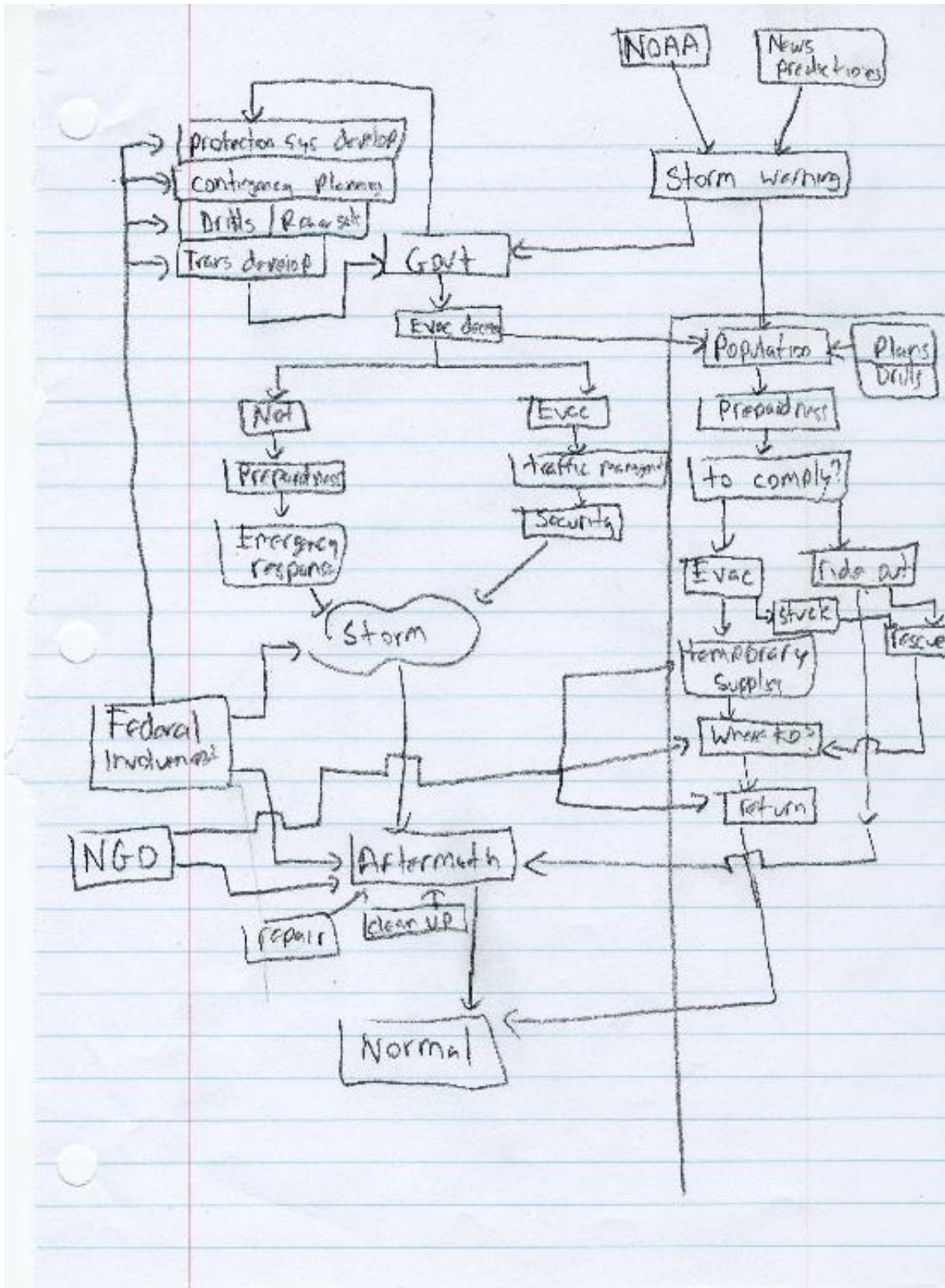
Figure 4 - The First Sketch of the Model
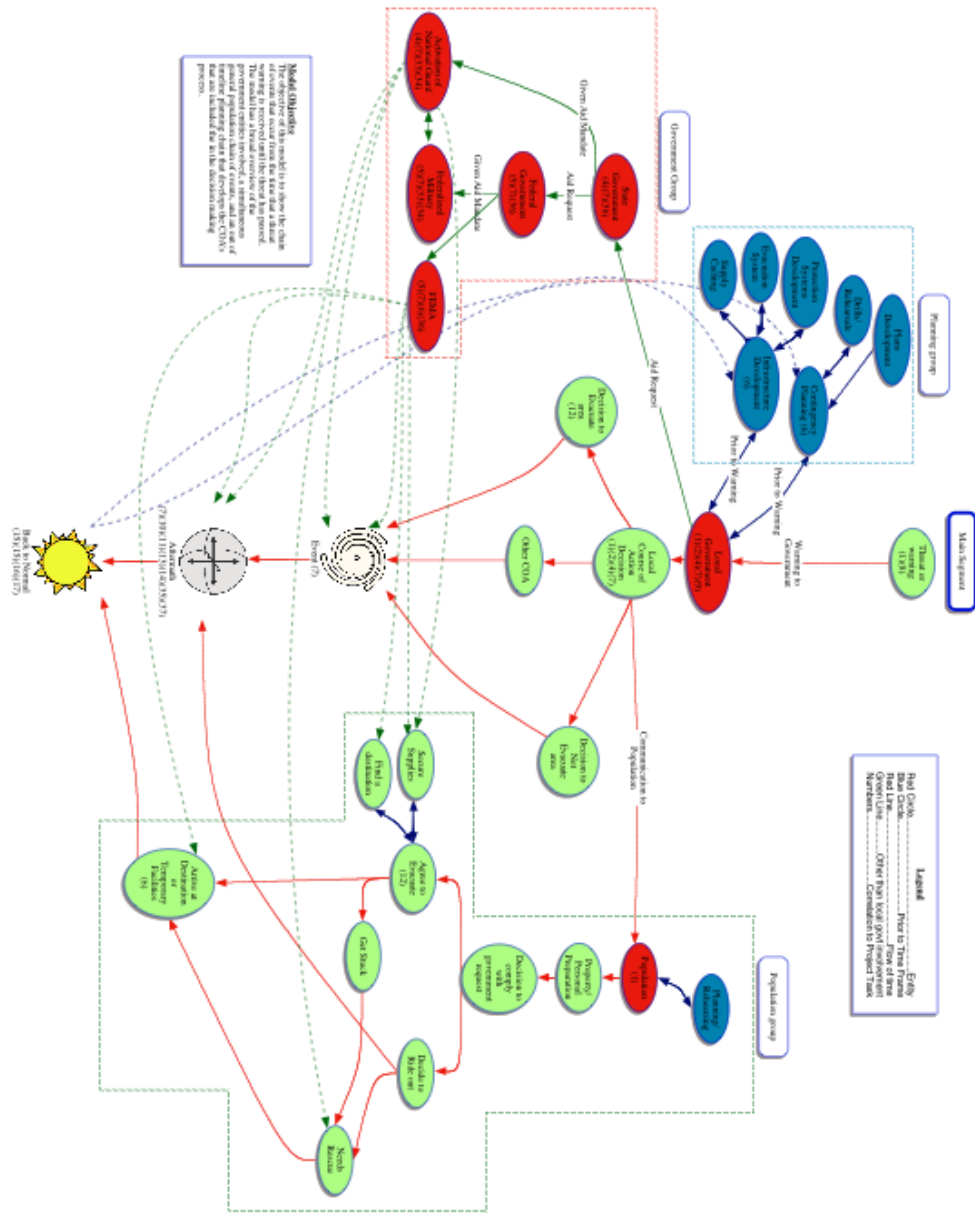
Figure 5 - A Draft of the Model

3.3) Choosing Presentation Medium

The website was developed in order to convey the model and the reasoning behind it in a familiar, easily understood, and publishable format.   The concept of developing a website stemmed from a brainstorm that was intended on improving the presentation of the model. The model in itself, is a series of associations between discrete states and groups of these states, it is then, the report's duty, to explain and add reason to the model's structure. In creating a website, the intent was to present the model with the same information attached to it that the report would carry in a manner that can be far more readily absorbed than reading a report with a non-interactive model centric to it. From this, the idea of a dynamic medium came as a natural step. This was actualized by making the model the centerpiece of a website, the hub through which the user can enter, and traverse the compiled website. This was done by making the model an sort of selectable map, where if a user wanted to see the research behind a specific grouping or section the user would click on the respective group or section, and would be brought to a web page with the research, conclusions, and sources for that group or section. This decision afforded several key advantages: the website could be readily published and reach far more people than the report alone; it was a format that allowed dynamic and active linking to other knowledge centers; it allowed for continuous, transferable, and easily extensible work on the project past the completion date, and it allows for the presentation of the same material in the report but in a far more cognitively digestible format.

3.4) Choosing Software Package

Choosing the software package was an important part of the development and implementation of the website. The software package filled a small, but important role in

creating an "image-map." An image map is a transparent digital overlay that aligns with different parts of the image, creating a webpage where different areas of the picture are click-able hyper-links to various web pages. This is a feature that would be later used to make the model the hub of the website. The software package was to be able to create this in addition to providing intuitive model-making capabilities. The package that was chosen was Inspiration 8. It contained an intuitive and basic model making interface that afforded rapid model prototyping and allowed for the model to be image-mapped.

3.5) Website Development

The website was created by building off of the image map of our model produced by the Inspiration 8 software. Using Adobe Dreamweaver, additional pages where added for each of the sections ("bubbles") present in the model. Each of these pages contained the abstracts from the section as well as the value of the source. In addition to listing the sources used, the sources value and the information distilled from it are listed as well. The individual pages where then linked to the model and to similar pages within the model.

3.6) Organization of Material – Model

Before any material was gathered for this project, the individual subjects had to be determined. The group brainstormed together and decided upon two major groups for the model: the Planning Group and the Government Group. The members then decided to narrow the project down by only investigating the decisions that would be made in the Planning Group and the Government Group. These groups contained more specific subjects within them (Figure 4-1).

The Planning Group contained subjects directed at the planning that would go into an evacuation plan before it would be implemented. This group contained the decisions that had to be made well before a natural disaster would strike. This group would have information such as the development of evacuation plans, as well as any contingency plans that would be developed for an evacuation. It included any drills and rehearsals that would be done to prepare the local population for an evacuation. Also, it contained any protective systems that would be constructed to help prevent destruction in the wake of a natural disaster, like the dike and levee system in New Orleans that was devised to protect the city from flooding.

The Government Group contained the different levels of the government that would be involved in a natural disaster and their roles. This group contained decisions that would be made by each level of government in the event of a natural disaster and an evacuation. This group would have information pertaining to all decisions that would be made by the Local Government, the State Government, the Federal Government, and the Military (Federalized and National Guard).

3.7) Criteria for Evaluating Material

The group developed specific criteria for evaluating the material that had been gathered to be used in the model. This criterion was used by each member to determine the importance of each piece of material they found, and the overall importance of the source.

Each member was assigned a specific topic to gather information about. They would then read through the various articles that have been collected. In each article, any information that pertained to their particular topic was noted. Next, each member would decide the importance of the information gathered and the general theme of each article in regards to their topic and give it an overall rating. The material's importance was determined by how well it defended the point that was trying to be made. For instance, this study looked at the decisions

made during Hurricane Katrina. One decision that had to be made at multiple governmental levels was whether or not to evacuate. Now if the information found from the source simply stated that there was an evacuation, then its importance would not be very great. But if the information from the source stated more useful things like the time and date the evacuation was ordered, routes that were to be used, etc., then the information's importance would be much higher. The importance of one piece of information was only relative to the other information that had been gathered.

The criteria for evaluating material included: its relevance to the decisions making process, its relevance to the assigned topic, and whether it pertained to Hurricane Katrina, Hurricane Gustav, or the accepted norm established by professionals and government agencies specializing in disaster management, for an evacuation. Firstly, for any information gathered to be deemed important, it had to be about the decision making process. Secondly, the information had to pertain to the topic that the individual group member was investigating. Each group member would read through each of the sources multiple times, each time paying attention to information for their specific topic at present. Lastly, the information had to pertain to a decision that related to Hurricane Katrina, Hurricane Gustav, or the textbook definition of an evacuation. This was decided because the ultimate goal of this project was to develop a model that showed the decision making process during Hurricane Katrina, Hurricane Gustav, and the textbook answer for what should happen so that the three could be compared and contrasted.

3.8) Abstract Development

Throughout the project, as each team member read through and classified material, abstracts were developed. The main purpose of the abstracts was to establish a short

summary of the material for future reference and to allow other team members to get up to speed on the information. The abstracts differed from the published abstracts because they focused on the material and key points that were specific to our project.

4.0) Results:

4.1) Introduction:

The final model and website are presented in this section. The model is intended to be viewed on the website but it is presented here to allow written discussions for all the parts. The model is displayed along with a Legend in Figure 6. The legend defines several color-coded groupings. The groupings are the Planning Group, the Main Group and the Government Group. Each color-coded grouping from the model is then further described in an individual section. Graphics depicting the website will also be presented along with instructions for its use.

4.2) Model Diagram:
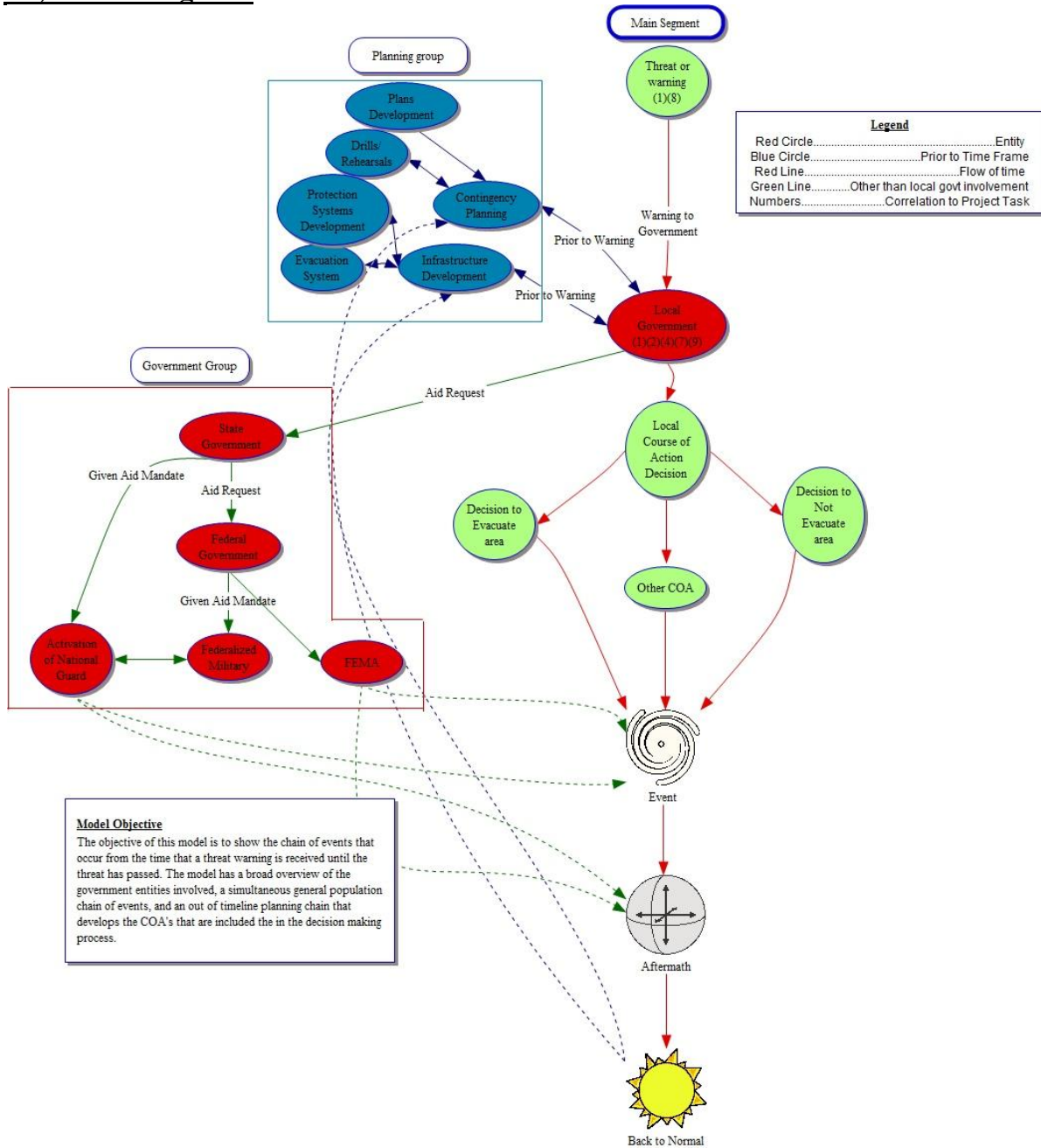
Figure 6 - Decision Making Model

4.3) Model Description:

The objective of the model is to show the chain of events that occur from the time that a threat warning is received until the threat has passed. The model has a broad overview of the government entities involved in a disaster response, and a planning chain that would occur before the event in question but develops the courses of action for those making decisions. The model was color-coded by grouping as depicted in the legend.

The main decision making chain of the model begins with a threat or warning of an upcoming event. The primary focus is the decision of the local government on whether or not to evacuate. The government group (see section 4.5.2) discusses the decisions and actions that are taken when a disaster progresses beyond the scope of the local government. Here, it becomes necessary for higher levels of government to take action.

The planning group (see section 4.5.1) is on a different timeline from the rest of the model because it is intended to take place before the threat or warning is received. It is included in the model because it provides the plans and major frameworks for possible courses of actions to be considered by decision makers. It also includes rehearsals that ensure that the decision-making process runs smoothly during an actual event.

The model provides an overview of what occurs during and after the event, as well as the process that occurs as the government returns to normal operation.

4.4) Website Description and Operating Instructions:

The website will start with the user at the website model, with a key and a description. Along the right hand side of the model the user will see the flow of events. These are linked to the left hand side, which shows the planning group and the government group. Clicking on any

of the ovals within the planning group or government group will bring the user to a text-based webpage that contains the abstracted information for that section and the sources that were used to obtain the information. The sources are listed so that the information distilled from them and its evaluated worth is readily available. At the bottom of each section's webpage there will be anywhere from one to four links. These links lead to other web pages from the model with related information. The last link in the list is the "Site Map" link, which will bring the user back to the model where the user can select another section. Through the review of this information and the resources, the user will be able to easily access the major findings of this project and then for a more in-depth look, browse the supporting evidence.

4.5) Model Section Discussion:

This section discusses the material that was gathered throughout the project. Each subsection utilizes a discussion of the decisions made during Hurricanes Katrina and Gustav that serve as examples to illustrate the considerations that ought to be taken into account for each section of the model.

4.5.1) Planning Group Discussion:
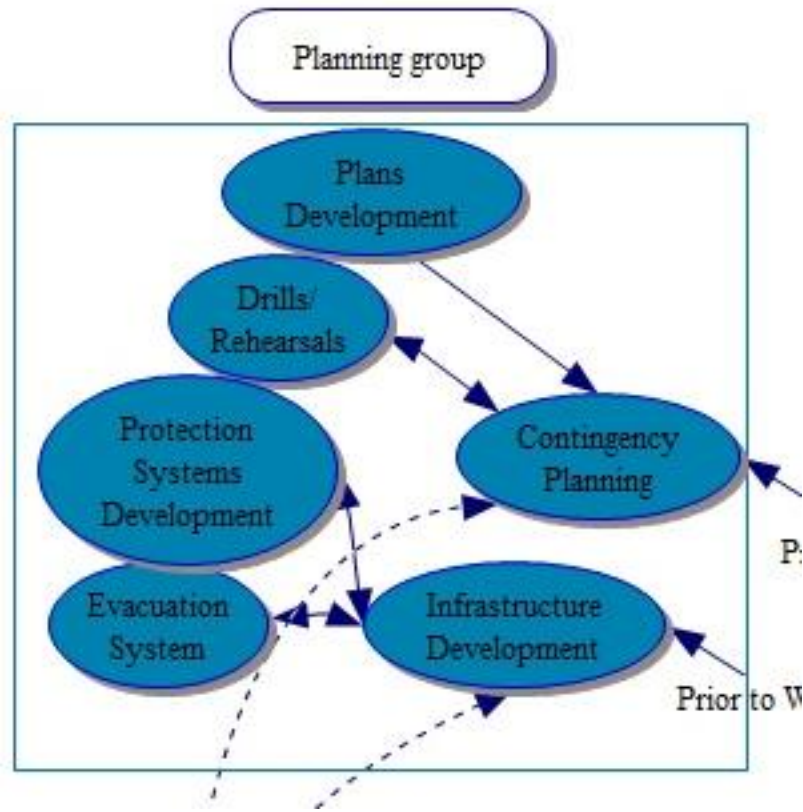
Figure 7 - The Planning Group (See Figure 6 for Complete Model)

The planning group is time insensitive and expected to occur before a threat or warning is received. It is intended to provide decision makers with plans and possible courses of actions in response to different types of events. It also encompasses rehearsals and drills to ensure that decision-making is able to occur as efficiently as possible during an event. The planning group also covers the development systems that could be used to protect against weather or a man-made event and the development of an evacuation system.

The planning process is important because it makes the decision-making process more efficient and allows the pros and cons of different courses of action to be developed and tested without the time constraints of an impending event. The infrastructure development process is

important because it gives decision makers more options and can buy time during a disaster that can be allocated to decision making or an extended evacuation.

4.5.1.1) Plans Development:

In developing preparedness for any disaster, extensive plans must be developed. These plans must also account for contingencies to the many variables that may arise. Furthermore, the plan making groups are responsible for disseminating their plans, ensuring that they are practical, and ensuring that they are tested thoroughly.

The events that preceded and followed Hurricane Katrina serve as an example of why planning should never be an afterthought and should always be at the top of every emergency government agency's priority list. In addition to making a plan, it must be rehearsed thoroughly. No matter how just the reasoning is behind a plan, it is a script that needs to be followed, one that allows for freedom of action, but still provides steps and actions that need to be followed.

In New Orleans, the city had planned for the evacuation of over 100,000 residents, who did not own cars, by having them provide their own transportation to local schools and then have busses transport them out of the city (US Census Bureau, 2000). This plan had two major shortcomings; first, it required all residents without cars, young and healthy, old and sick alike, to figure out how to get themselves to these local schools. Second, it depended on an asset that was not guaranteed in the event of a disaster. The New Orleans Regional Transit Authority (NOTRA) was supposed to provide the busses. Even though it was a government agency, the assumption that all vehicle operators and maintenance personnel would be present was incorrect. Many had heeded the warnings to evacuate instead of staying in the city, which would have

forced their families to go on without them, or worse, put them in harm's way by keeping them in the city.

When the order came to evacuate, and the 100,000 who did not have cars began to make their way to be picked up by these busses, some were greeted by NORTA busses, but others found deserted schools where no busses had come and none would come. These people were left in the city to face the storm alone.

Evacuation planning further proved to be an area where City of New Orleans government failed when the 34 hospitals within the City limits began to evacuate their patients. The New Orleans emergency plans had presumed that the hospitals would be able to handle the evacuation of their patients with the available emergency services, which included both New Orleans EMS and the private EMS contractors that operate in the city. When the storm hit, some of the EMS services that had contracts with FEMA and the Louisiana Department of Homeland Security and Emergency Preparedness did not have the manpower or management presence required to fulfill their commitment (Zwerdling & Sullivan, 2005). This left the 34 hospitals in the city of New Orleans to transport their entire occupancy with an understaffed fleet. This led to the movement of patients in Personally Owned Vehicles (POVs) that were not equipped for patient care.

During Hurricane Katrina, the Louisiana emergency communications plan, made by the New Orleans Police Department, stated that if land lines where down, cellular telephones or the state police radio system would be used for communications and if these went down, land lines were to be used. This plan clearly contradicts itself. Within one hour of making land fall, Katrina had wiped out all communications, both land-lines and cell and radio communications. This forced police on the ground to use store-bought radios, but after several hours the batteries in these failed. Police and other relief forces were forced to travel in groups in order to remain in

contact, and this greatly diminished their effectiveness. This failure was further exacerbated by a complete lack of interagency compatibility in short wave radios (Zwerdling & Sullivan, 2005). When relief actually came, interagency communication was restricted by bottlenecks where information had to be communicated across networks.

In the aftermath of Katrina this fatal flaw in planning was recognized and corrected. Police forces were outfitted with military style radio systems that are capable of communicating directly with one another without dependency on an infrastructure. This standard would also be, by default, compatible with all Department of Defense network (DODnet) communication compatible equipment and Unites States Army National Guard (USANG) and US Armed Forces radios.

4.5.1.2) Rehearsals and Drills:

One of the fundamental parts of contingency planning is the rehearsal of a well-thought plan. Conducting disaster management drills provides the ability to test the arrangements of the plan in a controlled environment, without the risk of injuring civilians or structures. There are various levels of rehearsals that can span from what a homeowner will do with his family to what the federal government's response will be. This broad range of rehearsals will obviously vary in cost, but they are all important to understanding the strengths and weaknesses of a plan in a real-time environment.

Disaster drills should be relevant to a specific location and take into consideration infrastructure, population centers and worst-case scenarios (FFIEC, 2008). While it would be best to have the ability to put every government resource in place, sometimes that ability is not physically possible. There are just some things that cannot be fully simulated, but can be closely

approximated. The more curves that are thrown at those participating in the disaster drill, the better prepared they will be for anything that comes their way during an actual event. Everyone can expect the ordinary, but it is the uncommon occurrences that will cause confusion and disorder. Performance assessments after the conclusion of the disaster drill helps to ensure those involved know what was working and what could be improved upon, and therefore make adjustments to the plan.

Prior to Hurricane Katrina there were little to no drills and rehearsals preformed to aid in the contingency planning effort. The events that followed the landfall of Katrina showed why rehearsing plans was important for the success of disaster management. No matter how solid a plan looks in theory, when applied it may fall to pieces, and the only way to know is to test it out.

An ABC poll conducted on September 2nd showed the largest criticism came down on the state and local government's (led by Governor Kathleen Blanco and Mayor Ray Nagin) inability to initiate the New Orleans evacuation plan in a timely manner (Langer, 2005). The inability to act, as demonstrated by Nagin waiting until 19 hours before the landfall of Hurricane Katrina to initiate the evacuation, was not an example of poor planning, rather, a result of lack of rehearsal (US Congress, 2006). A bipartisan report on the preparation and response to Hurricane Katrina found that FEMA and the Red Cross did not have the resources and logistics that were capable of dealing with the tremendous need of the people of the Gulf Coast (US Congress, 2006). These shortcomings would have become more apparent had there been a disaster management drill, and the problem would likely have been avoided.

One reason Gustav was relatively less devastating to New Orleans compared to Katrina is the fact that it hit a greater distance away from the city at a lower intensity. Another reason was the preparations through drills and better planning. During the spring of 2006, Louisiana held a

hurricane drill to evacuate New Orleans, to "prevent the widespread confusion, especially among the poor, that accompanied the approach of Hurricane Katrina last year" (Plaisance, 2006). This test included bussing 80 volunteers to the convention center as a mock 3 hurricane was approaching the coast (Plaisance, 2006). The evacuation for Hurricane Gustav was much more successful, with close to 2 million civilians being evacuated, and the resulting damages of the storm were much less (Anderson, 2008). It was the disaster planning and rehearsal of that practice along with the drive created from the embarrassment caused by Katrina.

Drills and rehearsals are just an important piece of the contingency planning as the plans development. While the plans may seem to work on the paper, when applied deficiencies become more apparent. This allows for the ability to continuously improve the response ability. In addition it provides an additional training opportunity for emergency response units. Most importantly, it saves lives. While it may be a minor inconvenience to the civilians in the area of the rehearsal, it will make a permanent difference when faced with a real disaster.

4.5.1.3) Evacuation Planning:

Evacuation planning is a key part of emergency management planning. An evacuation of 1000 people or more occurs every three weeks on average (FHWA Primer 9, 2006). The majority of the occurrences are from natural or technological causes, with only six percent being from malicious acts. Between 1991 and 2003 there were 17 evacuations of 100,000 or more people with 15 evacuations related to hurricanes and the remainder responses to terrorist attacks (FHWA Primer 9, 2006).

The Federal Highway Administration (FHWA) divides roadway evacuation planning into four phases: Readiness, Activation, Operations, and Return to Readiness. The Readiness phase

addresses ongoing planning. The Activation and Operations phases occur in response to a

warning about an event and will be discussed in a subsequent section. The final phase is the

Return to Readiness phase which includes conducting an after action review to determine what

went well and what didn't as well as the transition back to the readiness phase (FHWA Primer

29, 2006).

The readiness phase is when the main planning effort occurs. The first step is to identify

the stakeholders (including the private sector) in an evacuation and engage them in the planning

process. Subject matter experts should be identified and also included in the planning process.

Some examples of stakeholders are emergency managers, decision makers, transportation

officials, first responders and volunteer organizations (FHWA Primer 13, 2006).

Planning must be coordinated several levels up in government to ensure that the planning

in one area is compatible with other localities. This is especially true in plans that include contra-

flow, an event in which both sides of a highway are adapted for travel in the same direction,

because this device has a regional impact (Federal Highway Administration Primer 17, 2006).

Mutual-Aid agreements should be developed with other localities or to higher levels of

government in anticipation of a locality's resources being exceeded during an event (FHWA

Primer 16, 2006).

A database should be created to monitor the status of key roads and support equipment

(FHWA Primer 11, 2006). This makes it easier for planners to take road capacity and other

factors into consideration when writing plans. Communication is another important factor for

which to plan. Without communication decision makers will not be able to gain an accurate

picture of events to make decisions or to execute them properly (FHWA Primer 57, 2006). Plans

should be developed to account for the flow of information during an event and how they affect

decisions that have already been made, or will be made. Information should be fed to an

Emergency Operations Center (FHWA Primer 14, 2006).

Plans must also be developed to deal with traffic incidents, such as a car accident, that

occur during an evacuation. Plans should pre-position clean up and recovery assets throughout

the evacuation area. This saves time for an accident cleanup, limiting the disturbance caused as

much as possible (FHWA Primer 25, 2006).

The return of evacuees also needs to be addressed. While there is less of a time

constraint, many of the same factors that affect the initial evacuation will impact the return. The

FHWA coins this as a Tier II evacuation while the initial evacuation is called a Tier I evacuation

(FHWA Primer 30, 2006).

While there were Federal plans in place for disaster management prior to Hurricane

Katrina (Section 4.5.2) the plans in New Orleans were not developed thoroughly. The plan was

refined and developed based on hurricanes that occurred in 1998 and 2004. The state discovered

that conventional evacuations were inadequate and developed contra-flow plans on major

highways. (Wolshon, n.d.)) The evacuations in 1998 and 2004 were slow and received a lot of

criticism. However the two hurricanes did not hit in the areas anticipated, resulting in limited

damage. This kept a lot of attention away from the plans. Evacuation plans are difficult to

develop because the transportation systems were not usually designed for evacuation traffic and

evacuees further deteriorate the situation by evacuating at the wrong time or waiting until the last

minute (Wolshon, n.d.). While the pre-Katrina plans at the local and state level systematically

facilitated the evacuation of standard vehicles, they were thoroughly inadequate for citizens

without vehicle transportation, medical patients, and others who needed assistance.

Prior to Hurricane Katrina, the exit capacity of New Orleans was estimated to be sixty-seven percent in twelve hours (Samost, n.d.). During the storm, it was estimated that eighty to ninety percent of the city was able to evacuate conventionally in half the time that it was estimated to take (Wolshon, n.d.). The failure of the other ten to twenty percent to evacuate was not due to the highway system, but due to various other factors such as no transportation, low mobility, or a refusal to evacuate. While the highway evacuation was successful, the evacuation by other methods was a failure. Between one hundred and three hundred thousand people remained in the city. The plan for evacuating the citizens who had low-mobility consisted of encouraging neighbors to help neighbors and deploying regional busses to move citizens to the Super Dome from different locations around the city (Wolshon, n.d.).

After Katrina, a large effort was placed on improving evacuation plans for future storms. To improve communication, New Orleans posts their evacuation plans online. A significant effort was invested in determining how to evacuate citizens with low mobility. In 2006 the FHWA prepared a report for Congress on evacuation planning for catastrophic hurricanes. The report states that local and higher governments were adequately prepared to handle non-catastrophic evacuations but still face shortfalls in catastrophic hurricanes like Hurricane Katrina (FHWA-REP 25, 2006). The report recommends continued planning and rehearsals between different levels of government and across different areas of the region. Louisiana now publishes the statewide highway evacuation plan online depicting the different phases of an evacuation depending on where citizens are located, the contra-flow highway map, and the special procedures for entering the wrong side of the highway during contra flow operations.

The combination of better planning and preparedness, combined with the storm's lower intensity led to a more successful response to Hurricane Gustav. In this event, citizens were

evacuated by air, rail, car and bus. During a testimony to Congress, Lt. Governor Landrieu of Louisiana described some of the improvements in the government's response during Hurricane Gustav when compared to Hurricane Katrina. The state enacted a larger evacuation to include citizens with low mobility. Overall 1.9 million people were evacuated from southern Louisiana making it the largest evacuation in Louisiana history. The State also successfully conducted the largest evacuation of US medical patients to date, evacuating 10,400 patients (Anonymous 3, n.d.). There were 7,500 citizens who evacuated by rail and air (Anonymous 3, n.d.).

Evacuations are difficult to plan for but remain a key part of emergency management planning. Plans will continue to be refined after every storm or rehearsal and with the infusion of new techniques developed or acquired from sharing information.

4.5.1.4) Protective Systems:

Decisions have to be made concerning protective systems designed to protect the local population from natural disasters, like hurricanes, tornadoes, or some other predictable threat. One decision is whether or not protective systems are needed. Protective systems can be built to offer an increased protection for the people and buildings in the area. Such is true for New Orleans and the threat of a hurricane's storm surge. The storm surge is the most destructive part of a hurricane as it causes flooding (Daniel et al, 2007). Protective systems need to address this risk.

In New Orleans, it was decided to build protective systems and they were under the control of the Corps of Engineers (United States Government Accountability Office, 2005). The two main protective systems in New Orleans were pumps located within the city limits, and levees built around it. Pump stations were constructed within the city limits to prevent flooding. Internal

outfall canals are used to transfer water that accumulated inside the city of New Orleans to the pump stations (Daniel et al, 2007). At the pump station, the water was pumped out of the city. This system was only designed for rain water, and could not handle the amount of water that flooded the city during the storm, resulting in the pumps becoming backed up and flooding, rendering them useless (Daniel et al, 2007).

The levees consisted of earthen levees, I Walls, and T Walls. Figure 8 illustrates typical designs for I walls, T walls, and earthen levees. Earthen levees are mounds of earth compacted to form a barrier between a body of water and land that would otherwise be flooded if the levy was not there (Daniel et al, 2007). In New Orleans, this land was neighborhoods and business districts. The earthen levees around New Orleans needed to be raised. In order to raise the earthen levees, the base needed to be increased (Daniel et al, 2007). Since most of the land leading right up to the edge of the levies had been developed, this option was not practical (Daniel et al, 2007). Instead, flood walls were constructed on top of the earthen levees. These walls could be either I walls, or T walls. An I Wall is a vertical wall built into the top of the levy, whereas a T Wall is a vertical wall built into a footing within the levy, resembling an inverted capital T (Daniel et al, 2007).

Another decision that had to be made concerning the protective systems pertained to the repair of the levees that failed in New Orleans during Hurricane Katrina. The failures in the levees were caused by the storm surge. Of the 350 miles of protective walls, 169 miles of them were damaged during the storm resulting in about 50 separate rupture locations (Daniel et al, 2007). These failures caused the massive flooding that produced so much destruction (Daniel et al, 2007). The Mississippi River-Gulf Outlet levees were overtopped by the storm surge and the water eroded them away, causing failures along that section. As well as being overtopped, four I

wall sections failed. During Hurricane Katrina, the only walls to fail were the I walls (Daniel et al, 2007). They were less expensive to build than the T walls, but the T walls proved to be much stronger (Daniel et al, 2007).

It was decided that the Corps of Engineers would control the repair of the levee system following Hurricane Katrina (Santora, 2006). There were 52 specific parts of the levee system that needed to be repaired, and the Corps contracted this work out to private construction companies in Louisiana (Santora, 2006). The repairs included adding barrier gates to the mouths of drainage canals so that storm walls suspected of being damaged did not have to be rebuilt, and installing massive pumps in the drainage canals to pump storm water out of the city (Santora, 2006). Storm walls also were increased in height by about 3 feet. There was much questioning of the Corps' work in the repairs and many people doubted the repairs would stand their first test, Hurricane Gustav (Santora, 2006). When Hurricane Gustav hit the Gulf Coast, the work that the Corps had done to protect New Orleans performed as designed and there were no reported problems (Anonymous 2, 2008).
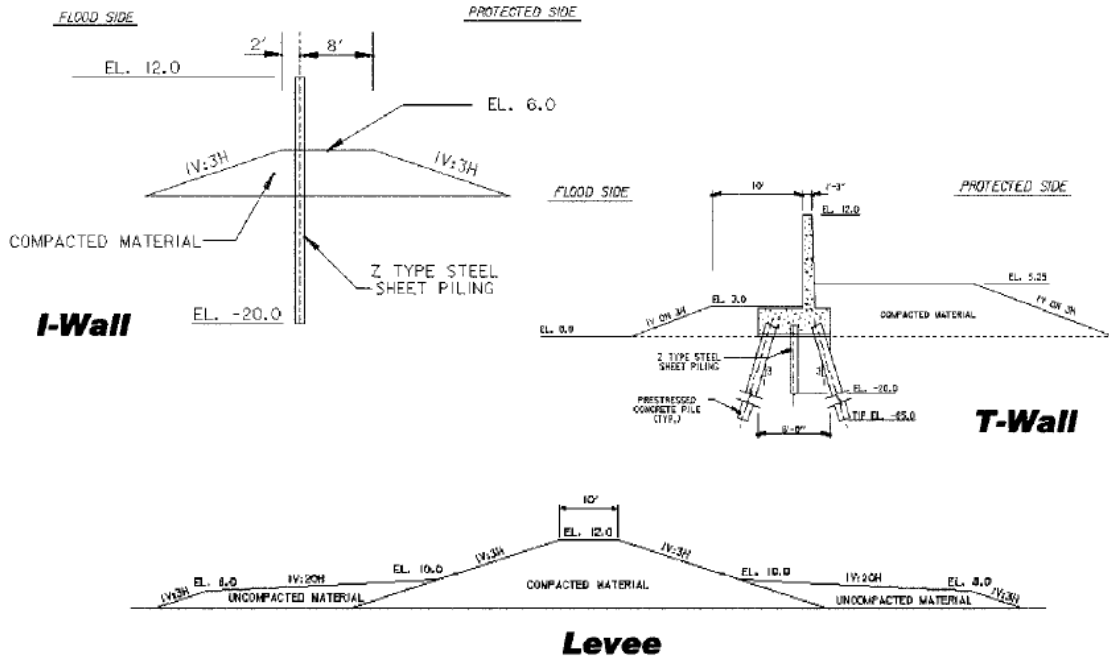
Figure 8 –Diagram of Pre-Katrina I Wall, T Wall and Earthen Levee Designs

4.5.2) Government Group Discussion:

The Government Group represents decisions that would be encountered by the different Government levels once the threat of an imminent disaster was forecasted, during the disaster, and directly after the disaster had occurred. This group included decisions encountered by local government, state government, Federal government, National Guard military forces, Federal military forces, and FEMA.
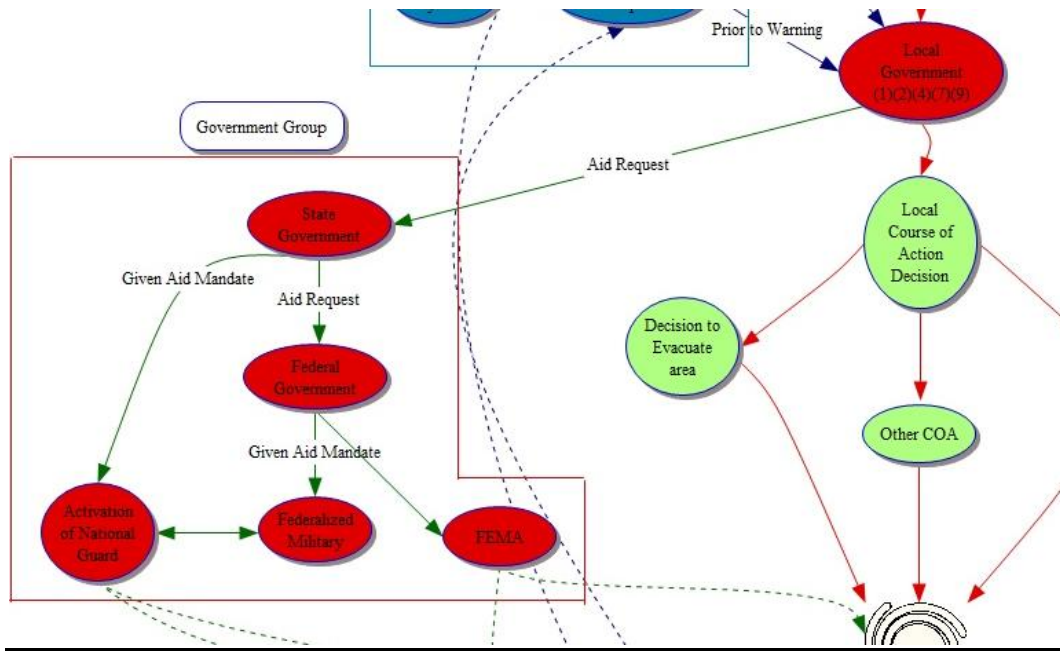
Figure 9 - The Government Group (See Figure 6 for Complete Model)

4.5.2.1) Local Government:

There were many decisions that had to be made by the local government during

Hurricane Katrina. These decisions involved preparing for natural disasters, identifying the need

for an evacuation, ordering evacuations, and recovery efforts.

There was a strong lack of any plan for an evacuation during the events associated with

Hurricane Katrina in New Orleans. In June of 2004, FEMA contracted work on a New Orleans

disaster plan to the firm Innovative Emergency Management (IEM) (Anonymous 1, 2008). The

firm developed a model of a fictitious hurricane that would hit New Orleans and supposedly

developed an emergency plan, but no plan exists at present (Anonymous 1, 2008). After

Hurricane Katrina, the ensuing investigation uncovered no plan for an evacuation of New

Orleans (Palast, 2006). Whatever the case, it can be assumed that there was no functioning

evacuation plan that could be put into place during Hurricane Katrina.

Historically, the mayors of New Orleans typically decided to not put time and effort into planning for the event of a hurricane. They viewed natural disasters as minor problems that could take a back seat to more pressing local matters, such as unemployment, crime, housing, or education (Congleton, 2006). They were limited to two, four-year terms of office, so they had to deal with pressing issues instead of thinking far in advance, especially if they were up for re-election (Congleton, 2006). Many mayors would never even be confronted with a large hurricane threatening the city, because it happened so infrequently (Congleton, 2006). Furthermore, allocating city resources for hurricane protection would only benefit future mayors who would look well prepared, but there was no benefit for the current mayor (Congleton, 2006). Mayors instead allocated their resources to public works projects that would be visible to their voters like new roads, schools, libraries etc (Congleton, 2006).

Another decision that was made at the local government level was the decision to evacuate. Mayor Ray Nagin was the mayor of New Orleans at the time of Hurricane Katrina (Burby, 2006). When it became apparent that New Orleans would be in the path of Hurricane Katrina, FEMA members met with local officials in New Orleans. It was decided that emergency personnel and supplies would be set up at various locations along the expected hurricane impact area (Congleton, 2006). There were plans for moving large, portable pumps upstream from New Orleans that could be kept out of harm's way and keep the city from flooding; however this seems to not have been implemented (Congleton, 2006).

Mayor Nagin decided to order an evacuation of New Orleans, and officially ordered it on the morning of Sunday, August 28th, 2005(Guiney, 2006). It was the local government's responsibility to plan and to implement the evacuation routes. Mayor Nagin's orders did none of this. His official plan was for the residents to pack up and evacuate the city. He gave no direction

in regards to where the evacuated people would go, or what route would be followed (Congleton, 2006). This may be criticized now, but at the time it seemed like the correct decisions because individuals and families had the most at risk and had the best knowledge of their own circumstances and opportunities concerning an evacuation (Congleton, 2006).

A large number of residents in New Orleans did not have the ability to evacuate on their own. To address this, Mayor Nagin decided to set up the New Orleans Superdome as a temporary shelter. The Superdome was staffed by local police, emergency staff, Louisiana National Guardsmen, and FEMA personnel who provided security and medical services for the people that stayed there (Congleton, 2006). Many residents chose to not leave their homes, businesses, etc and remained in the city. The Superdome could support the people who could not evacuate by their own means, but not all the people who chose to stay behind. It was not until the levees failed and portions of the city begin to flood that the Superdome became the refuge for more people than its capacity allowed (Congleton, 2006).

Once Hurricane Katrina passed by New Orleans and the levees began to fail, portions of New Orleans began to flood. New Orleans emergency services quickly began rescue efforts in the flooded areas. The New Orleans emergency staff was not capable of handling a disaster of this magnitude, especially since many had left the city with their families (Congleton, 2006). Mayor Nagin started calling for help from the State and Federal Government, but none seemed to come. It would be a total of 4 days after Hurricane Katrina hit New Orleans that relief would finally arrive for the people trapped in the city.

In comparison, the evacuation plan for Hurricane Gustav was much more successful than that for Hurricane Katrina. After the Katrina fiasco, the City of New Orleans revamped its evacuation plan. The new plan more clearly outlines the responsibilities of the Mayor. These

include initiating the evacuation and retaining overall control of the evacuation (City of New Orleans, 2009). The City's Office of Emergency Preparedness is to keep the Mayor updated at all times, advise him of courses of action, and communicate with State level officials about the evacuation (City of New Orleans, 2009). The Police Department is to control the traffic flow, keeping roadways open and cars moving, transport hospital patients, and direct evacuees to shelters once out of the danger area (City of New Orleans, 2009). Officers are to be placed at key intersections and roadways where they would manually direct traffic. The following time requirements have been imposed for an evacuation announcement: a Precautionary Evacuation Notice 72 hours before impact, a Special Needs Evacuation order 8-12 hours after the Precautionary Notice, and the General Evacuation Order 48 hours before impact (City of New Orleans, 2009). It has been determined that approximately 100,000 people in New Orleans could not evacuate by their own means, so shelters would be set up in schools, mostly, to house them (City of New Orleans, 2009).

Hurricane Gustav was the first test of the revamped evacuation plan, and it was fairly successful. Two days before landfall, Mayor Nagin decided to once again order an evacuation of the city. This time however there would be no shelter set up in the city like the Superdome had been during Katrina, everyone was to be evacuated (Schafer, 2009). Nagin stated, "We want 100 percent evacuation, it has the potential to impact every area of this metropolis area" (Williams, 2008). Adequate transportation was arranged for all evacuees (Martinko et. al, 2009). Seventeen bus pickup sites were located throughout the city to transport residents out of New Orleans who could not get out on their own (Williams, 2008). Nagin over predicted the storm's size and capacity claiming it would be worse than Hurricane Katrina and other deadly storms (Williams, 2008). Many residents reported the evacuation was much more orderly than for Katrina (Schiller,

2008). Homeland Security Secretary Michael Chertoff asserts that the reason that there were no dramatic stories of rescue or looting were because the evacuation was successful, there was no one in New Orleans when the storm came (MSNBC Staff, 2008).

4.5.2.2) State Government:

The National Response Plan defines the relationships and interactions between different levels of government during an event. It is meant to cover almost any type of event that has the need for emergency management. It was developed in response to the events of September 11th. A key premise of the NRP is that incidents are handled at the lowest level in government possible. (NRP 33).

When a locality's resources are overwhelmed, they may seek out assistance from the state government. The governor of a state is responsible for coordinating state resources and has the authority to institute emergency police powers if necessary (NRP 26). The governor is also responsible for providing leadership and pubic encouragement during a declared emergency. The governor is in command of the states' National Guard forces, when they are called up by the Federal Government, and may use them to assist during an emergency (NRP 26).The state government is responsible for ensuring that local emergency plans are developed and that they are compatible with plans from higher levels of government (NRP 26). It is unclear what the method of enforcement is.

The National Incident Management System was developed to enable consistency in large emergency management situations; it defines a framework for different leaders on how to manage the response to an event. It was created under the same congressional executive order that created the National Response Plan. While the National Response Plan defines responses for

certain situations, the NIMS describes the general organization for managing incidents and provides generic processes on how to respond to an event. The National Response plan is an application of the NIMS (NRP Brochure 2). The standardizations that were developed for it allow interpretation between different levels of government and agencies (IS-700 10). Figure 10 shows an example organization of a joint field office, which would be created temporarily in response to a natural disaster (NRP 47). When communication works properly, this configuration allows for unity of command and good situational awareness, which are important to a successful disaster response.

During Hurricane Katrina local governments quickly became overwhelmed and looked to state governments for assistance. Simultaneously the state government in Louisiana also became overwhelmed and reached out for limited federal assistance. However the Louisiana state government refused to accept the severity of the situation and turned down several offers that would have helped during the situation (Schneider 1). The governor initially refused to declare a state of emergency, which would allow for more federal assistance, declare martial law, or allow federalized National Guard troops to aid. This would have engaged other states to commit National Guard forces, who in some cases were already prepared to go but were waiting on administrative clearance (Schneider 1). All aspects of the response by the state government have been thoroughly criticized since the hurricane by public and private sources. It was clear that much more was needed for a successful disaster response.

During Hurricane Gustav, the state government implemented plans developed after Hurricane Katrina. A state of emergency was declared seven days prior to the anticipated landfall, and the state emergency operations center was activated 6 days prior (LA Public Square 4). The situation was escalated through the chart in Figure 11 much earlier than during Hurricane

Katrina. During the activation period, shelters were prepared and supplies and transportation

assets were pre-positioned.

FIGURE 6. Sample JFO organization during natural disasters

JFO Coordination Group

Principal Federal Official

| Federal Coordinating Officer | State Coordinating Officer | Senior Federal Officials |

Note: Depending on the magnitude of the disaster, a Principal Federal Official may not always be designated, in which case the Federal Coordinating Officer will provide the Federal lead.

The State Coordinating Officer represents the State, and in some instances, the JFO Coordination Group may include local and/or tribal representatives as well as NGO and private-sector representatives, as appropriate.

JFO Coordination Staff

Chief of Staff

External Affairs

Safety Coordinator
Liaison Officer(s)
Infrastructure Liaison
Others as needed

Office of Inspector General

Defense Coordinating Officer

JFO Sections

Operations Section	Planning Section	Logistics Section	Finance/Admin Section (Comptroller)
Human Services Branch	Situation Unit	Coordination and Planning Branch	Time Unit
Emergency Services Branch	Resource Unit	Resource Management Branch	Procurement Unit
Infrastructure Support Branch	Documentation	Supply Branch	Cost Unit
Community Recovery and Mitigation Branch	Technical Specialists	Information Services Branch	Compensation/ Claims Unit
	Demobilization Unit		

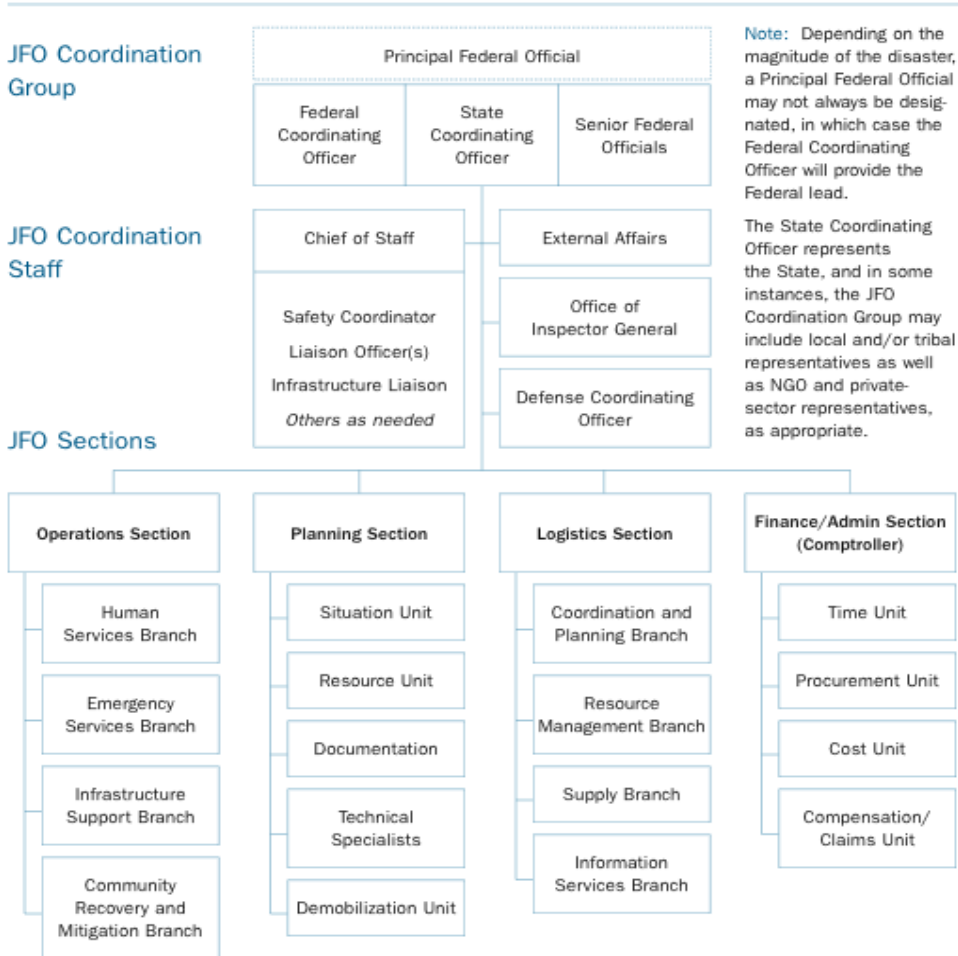December 2004 National Response Plan | 29

Figure 10 - Sample Headquarters Arrangement from NRP

The main problems during Gustav were the availability of supplies from the Federal government. To remedy the problem, the state took the initiative and acquired what was needed themselves, hoping to be reimbursed later (LA Public Square 5). An example of this is when the governor ordered the state to buy generators to power gas stations (LA Public Square 5).

During testimony to Congress, Lt. Governor Landrieu of Louisiana described some of the improvements in the government's response during Hurricane Gustav when compared to Hurricane Katrina. The state enacted a larger evacuation with increased modes of transportation including rail and air transport. The state also conducted the largest evacuation of US medical patients to date (Landrieu 2). Landrieu says that coordination with the regional FEMA office was smoother and that overall the improvement in planning since Hurricane Katrina positively increased the outcome (Landrieu 3). However after noting the improvements, Landrieu is quick to point out the need for continued improvements. He says that there were still problems with the chain of supplies coming down from higher levels of government, including basic supplies such as food and water (Landrieu 4). He goes on to stress the need for the continuation for plans development to prepare for future events and makes several recommendations.

The improved state government leadership and planning in conjunction with a less powerful storm led to the large improvement in state government performance during Hurricane Gustav when compared to Hurricane Katrina. This led to a much more favorable outcome. However the outcome was not perfect and it is clear that no matter how good planning or leadership is during a crisis, there is always room for improvement.

4.5.2.3) Federal Government:

A key premise of the NRP is that incidents are handled at the lowest level in government possible (NRP 33). When locality's resources are overwhelmed, they may seek out assistance from the state government who can then seek Federal assistance if its capability is exceeded (NRP 26). The response to an event can become Federally controlled when they are deemed to be of national significance. The quotation bellow defines the criteria for being of national significance.

1. A Federal department or agency acting under its own authority has requested the assistance of the Secretary of Homeland Security.
2. The resources of State and local authorities are overwhelmed and Federal assistance has been requested by the appropriate State and local authorities.
3. More than one Federal department or agency has become substantially involved in responding to an incident.
4. The Secretary of Homeland Security has been directed to assume responsibility for managing a domestic incident by the President. (NRP 22)

The NRP defines the roles of different members of the Federal government. The Department of Homeland Security is a main entity in dealing with Federal-level incidents and in emergency planning. The Secretary of Homeland Security is the main official responsible for dealing with domestic events (NRP 27). The Secretary becomes responsible for coordinating the federal response when the previously mentioned four conditions are met.

The other main government departments are the Department of Justice and the Department of Defense. As the head of the Department of Justice, the Attorney General is the chief law enforcement officer in the United States and is responsible for leading criminal investigations, usually through the FBI (NRP 27). The Department of Defense usually performs a supporting role as directed by the President. There are many other government agencies involved in disaster management with different levels of participation depending on the type of event. For example the Department of Energy would have a significant involvement in a nuclear

event (NRP 28). A homeland security Emergency Operations Center (EOC) is staffed twenty-four hours a day, seven days a week to monitor incidents that may develop national importance. A similar EOC at the FBI, the Strategic Information and Operations Center has operational control of the response to terrorist events (NRP 24, 44). Figure 11 shows how an incident can draw support from higher levels of government depending on the severity of the event (NRP 93).

During Hurricane Katrina, local and state governments were quickly overwhelmed by the situation and Federal assistance was made available. However the response was not quick, forceful, or substantial enough to remedy the situation. For example the state government of Louisiana denied some Federal offers of assistance and initially the Federal government was unwilling to force it on them or take full command of the situation (Schneider 1). The progression depicted in Figure 11 occurred far too slowly. By the time that the Federal government took control of the situation, it was too late for salvaging.

During Hurricane Gustav the Federal government acted much faster and implemented plans developed after Hurricane Katrina. The progression depicted in Figure 11Figure 11 occurred much earlier in the process. The government mainly acted through the Federal Emergency Management Agency (see section 4.5.2.6). The Lt. Governor of Louisiana during the storm testified about the federal response. He said that the state worked well with the Federal government and that a coordinated response based on past collaboration occurred (Landrieu 3). He also noted areas for improvement, including the further refinement of the supply chain to ensure that supplies reached those who need it faster. He also notes an incident where equipment that was supposed to be provided was not, and that the state had to procure the items on its own (Landrieu 4).

FIGURE 11. Overview of initial Federal involvement under the Stafford Act
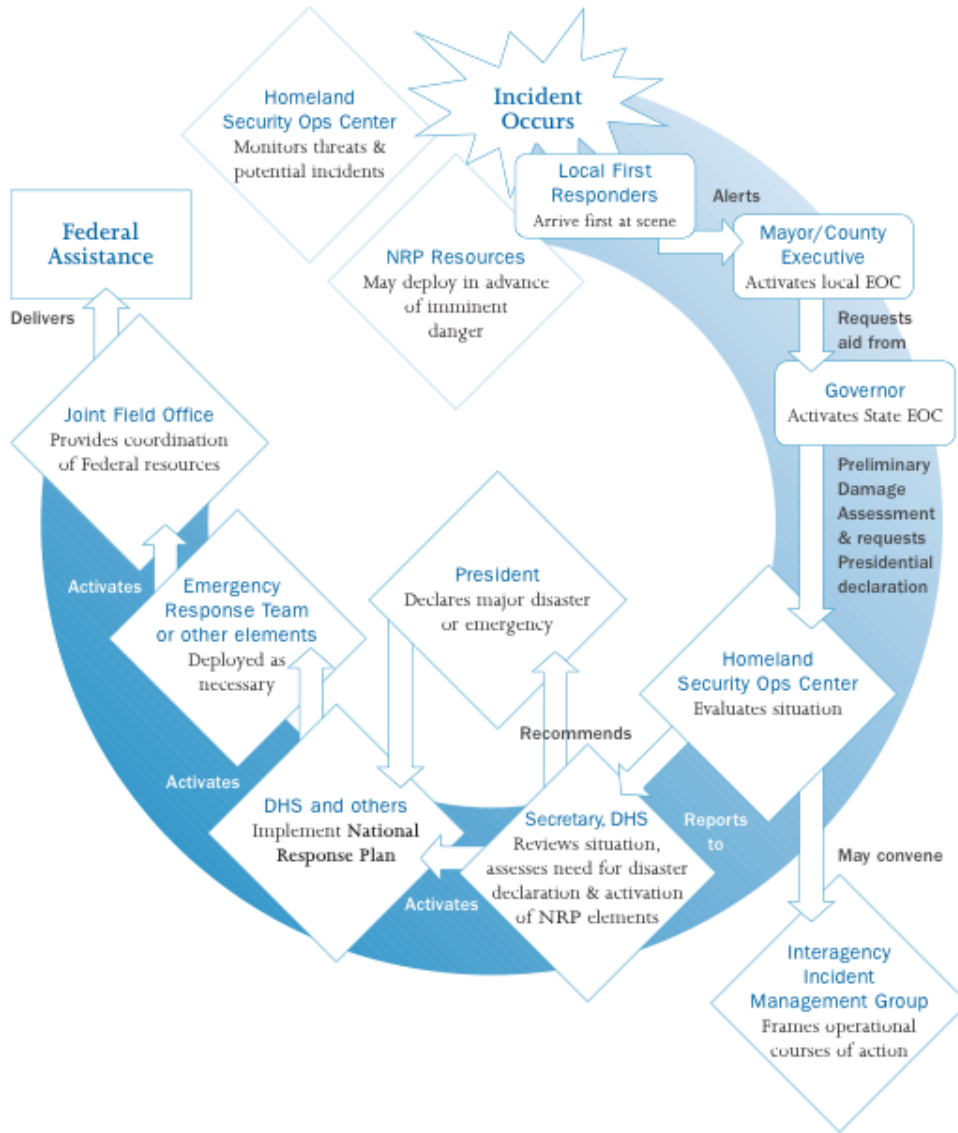
Figure 11 - The Escalation of an Event from Local to Federal Involvement as Described in the NRP

The Federal response to Hurricane Gustav was an improvement over Hurricane Katrina, in the same manner that the state government improved their response. The coordination and increased situational awareness during Hurricane Gustav led to a more successful response.

4.5.2.4) National Guard:

The National Guard of the United States is the reserve military force composed of federally recognized state militia members. It is composed of the Army National Guard as well as the Air National Guard. The governor or Adjunct General of each state can activate the National Guard to active duty to respond to certain domestic disasters and emergencies such as hurricanes. While governors only have the ability to call up their own guard troops, there are instances that deal far more damage that one state can handle alone. Governors may request aid from other governors to deploy their guardsmen as federally commanded troops in times of national emergency, which can only be declared by the President of the United States or the US Congress.

The National Guard played a major role in providing relief and recovery efforts. Thousands of National Guard troops came from Mississippi, Alabama, and Florida to New Orleans the day following landfall of Hurricane Katrina, while Louisiana National Guard had called almost 3,500 of its members to state active duty (Miles, 2005). The United States Northern Command established Joint Task Force Katrina based out of Camp Shelby Mississippi with approximately 58,000 troops in total responding to the emergency (Miles, 2005). Within several hours of the storm the troops were in the flooded streets and in the air saving lives. "As a result they were called the most well prepared agency responding to the disaster" (National Guard, 2005). The guardsmen took on the roles of security, damage control, humanitarian relief, search

and rescue, and repairing structures. While still facing deployments in Iraq totaling about 3,000, Louisiana Guardsmen assisted state police with the evacuation of New Orleans as well as helping to establish more than 120 shelters throughout the state as well as completing other missions (Meeks, 2005).

Much of the same action and results from the National Guard followed in Hurricane Gustav three years later. They were able to execute their mission with their limited supplies and manpower. Although the state leadership had learned from the last disaster that was Hurricane Katrina, they had not learned how to effectively use the abilities of the National Guard. However, by being called upon earlier by the state, The Guard was able to be mobilized more efficiently.

The military in general has always excelled in their leadership and rank structure. This well-organized machine was one of the greatest assets during the Hurricane Katrina and Gustav. Much of the manpower needed to assist in the response to either disaster couldn't have been achieved if it were not for the National Guard.

4.5.2.5) Federal Military:

Two days after Hurricane Katrina Hit New Orleans, President Bush met with Governor Kathleen Blanco and Mayor Ray Nagin on Air Force One as it was parked on the runway of the New Orleans International Airport. President Bush told Gov. Blanco that he had Federal troops ready to enter Louisiana and aide in relief efforts; his one condition was that all troops answer to the White House. President Bush made this mandate for one very important reason, to create a unity of command. Without a centralized and hierarchical command structure, decisions come from a myriad of people, most of whom are unqualified. This can lead to disastrous situations where the relief effort is torn in many different directions and excess collateral damage occurs

because of it. Governor Blanco's response is best told by Mayor Nagin, "She said she needed 24 hours to make a decision. It would have been great if we could have left Air Force One, walked outside, and told the world that we had this all worked out. It didn't happen. And more people died."

Events like this were all too common during the relief effort following Hurricane Katrina. Too many leaders were incompetent, they did not know how to make the hard decisions and hesitated, as seen above, and when action was taken it was often too late or the wrong decision all together. Proper leadership can take a given relief workforce and increase its effectiveness, poor leadership can hinder that same workforce and bring their effectiveness to an insignificant afterthought (US ARMY FM7-8. 1995). Mayor Nagin saw firsthand how effective leadership turned his city around. He said the following in regards to General Russel L. Honoré (US Army) (O'Brien, 2005), the commanding general of the Joint Task Force Katrina, the Federal military relief effort in the aftermath of Hurricane Katrina, "Now, I will tell you this -- and I give the President some credit on this -- he sent one <u>John Wayne</u> dude down here that can get some stuff done, and his name is [Lt.] Gen. [Russel] Honoré. And he came off the doggone chopper, and he started cussing and people started moving. And he's getting stuff done."

When the Federal military was allowed into New Orleans and the surrounding parishes, immediate improvement was apparent. Under the command of General Honoré, Joint Task Force Katrina was able to restore order, and provide the means necessary to bring supplies to the people who desperately needed it (O'Brien, 2005). Joint Task Force Katrina, along with the US Army Corps of Engineers, was able to provide the infrastructure to access some of the most flooded parts of New Orleans, bringing the first aid in almost a week to some. The aid granted by the Federal Military, once allowed, was the turning point in storm recovery.

The Federal military's involvement in response to Hurricane Gustav cannot be classified as a relief effort, because it was a proactive approach that started by staging well-equipped and well-trained troops close enough to the areas that were projected to need them, but far enough away not to sustain losses. Under the control of the U.S. Coast Guard's Eighth District Command and Incident Management Team, relief efforts were planned ahead of the storm making landfall and were set-up so that rescue and relief operations would commence automatically, with no bureaucratic go ahead needed. Incidentally during Hurricane Katrina, a fleet of search and rescue boats were staged and ready to be deployed when a bureaucracy held them in their moorings because they did not have proof of insurance (Jindal, 2008) The leadership provided by the U.S. Coast Guard was ideal for the search and rescue operations in a flooded environment (Gonzalez, 2008).

4.5.2.6) Federal Emergency Management Agency (FEMA):

The Federal Emergency Management Agency (FEMA) is the agency that is charged with guiding the federal response to disasters in the United States, both natural, and manmade. This role put the preparation before Hurricane Katrina and the recovery after squarely on FEMA's shoulders. The head of FEMA at the time was Michael Brown. Brown had been director of FEMA since 2003, but his actions during Hurricane Katrina prove that he was unqualified and inexperienced in emergency management. He joined FEMA in 2001 as legal counsel to his friend, FEMA director Joe Allbaugh (Washington Post, 2005). When Allbaugh left FEMA in 2003 Brown assumed his position as director. Prior to joining FEMA, Brown spent a decade as the Stewards and Judges Commissioner of the International Arabian Horse Association, but had never worked in the field of emergency management (Washington Post, 2005). During the

course of recovery efforts in Louisiana and throughout the Gulf Coast after Hurricane Katrina,

his lack of leadership ability and emergency management experience became painfully clear.

On August 31, 2005 at 12:20 PM the email shown in Figure 12 was sent to Brown from

Marty Bahamonde, a FEMA field agent in New Orleans.

```
-----Original Message-----
From: Bahamonde, Marty <Marty.Bahamonde@dhs.gov>
To: 'michael.d.brown@dhs.gov' <Michael.D.Brown@dhs.gov>
Sent: Wed Aug 31 12:20:20 2005
Subject: New orleans

Sir, I know that you know the situation is past critical. Here some things you might not
know.
Hotels are kicking people out, thousands gathering in the streets with no food or water.
Hundreds still being rescued from homes.

The dying patients at the DMAT tent being medivac. Estimates are many will die within
hours. Evacuation in process. Plans developing for dome evacuation but hotel situation
adding to problem. We are out of food and running out of water at the dome, plans in works
to address the critical need.

FEMA staff is OK and holding own. DMAT staff working in deplorable conditions. The sooner
we can get the medical patients out, the sooner wecan get them out.

Phone connectivity impossible

More later
--------------------------
Sent from my BlackBerry Wireless Handheld
```

Figure 12 – Brown Email 1

Brown's response is shown in Figure 13.

```
From:            Brown, Michael D
Sent:            Wednesday, August 31, 2005 12:24 PM
To:              'Marty.Bahamonde@dhs.gov'
Subject:         Re: New orleans

Thanks for update. Anything specific I need to do or tweak?
```

Figure 13 – Brown Email 2

On August 31, at 12:20 PM, Director Brown had first hand testimony from a FEMA agent in the field that the conditions were "deplorable" and that "many will die within hours" and his sole action on the matter was to casually ask if there was anything specific that could be done. His response demonstrated a clear lack of initiative and leadership. It is the position of the individual of the lowest rank in an organization to assume the role of the instruction executer; to be given an order from a higher rank and execute it with minimal mental intervention (USA FM7-8, 1995). Brown, in this instance and throughout his time as FEMA director, played the role of the lowest rank, even though he was the highest ranking individual within FEMA. In situations where he should have been looking at the big picture and identifying areas and facets of the recovery operation that needed attention or problems that needed to be resolved, and then passing that order down his chain of command, he was instead, not taking any action and waiting for his field agents to act without orders and then receive reports on the situation (USA FM7-8, 1995). When he received information from the field that the situation was dire, he asked the lower ranking individuals of his organization what he should be doing, instead of making the executive decisions to resolve the situation.

The failures of the FEMA leadership during the hurricane Katrina relieve efforts are not contained solely to Brown. On August 29, 2005, an email was sent up the chain of command relaying a TV news report of a levee breach occurring along the Industrial canal at Tennessee St., which was expected to spill 3 to 8 feet of water into Arabi and the 9th Ward of New Orleans (WWL, 2005). Another email, independent of the first, further informed the FEMA staff of failing levees in New Orleans is shown in Figure 14.

```
-----Original Message-----
From: Heath, Michael
To: Lowder, Michael
Sent: Mon Aug 29 11:51:18 2005
Subject: Re: Information

FYI...


From Marty. He has been trying to reach Lokey.

New Orleans FD is reporting a 20 foot wide breech on the lake ponchatrain side levy. The
area is lakeshore Blvd and 17th street.
--------------------------
Sent from my BlackBerry Wireless Handheld
```

Figure 14 – Brown Email 3

Brown's Response is this email is shown in Figure 15.

```
From:            Brown, Michael D
Sent:            Monday, August 29, 2005 12:09 PM
To:              'Michael.Lowder          'Michael.D.Brown
Subject:         Re: Information


I'm being told here water over not a breach
```

Figure 15 – Brown Email 4

His response clearly demonstrates a breakdown of communication and proper leadership at several levels. In order for the Director of FEMA not to know, of the arguably most destructive event of the week following Katrina, communication and coordination between several levels of leadership within FEMA had to have failed. This process of FEMA personnel on the ground receiving little to no guidance or support from the upper echelons of leadership was the norm throughout the recovery process for the Gulf Coast after Hurricane Katrina.

FEMA's actions before, during, and after hurricane Gustav were of a completely different nature. FEMA took a proactive approach to disaster management. FEMA, along with the Coast Guard, Defense Department and National Guard put more boots on the ground, equipment, and emergency supplies along the Gulf Coast than they did during Katrina. FEMA also increased its specialized search and rescue teams operating in the area from 7 to 18. In an attempt to prevent

the fiasco that occurred when FEMA sent too little food and water too late, they had 240 trucks of water and packed meals, plus 400 more trucks of blankets and cots staged just outside the affected area prior to the storm making landfall (Hernandez, 2008). Homeland Security Secretary Michael Chertoff, under whose supervision FEMA falls, said before he flew Sunday to Louisiana, all relief and rescue agencies were prepared for the worse, and to improvise, if necessary. Louisiana officials also learned the costly lesson from Katrina, by rehearsing large scale movement of aid and evacuees; they were able to much more effectively execute the evacuation. Louisiana Gov. Bobby Jindal said 1.9 million state residents evacuated before Gustav hit the area. Although FEMA head David Paulison was overly boastful when he said so, he commented that the evacuation was "one of the most successful and most well-coordinated evacuations" that he knows of (Hernandez, 2008). FEMA was able to take the lessons from its robust and plentiful failures during hurricane Katrina and directly apply them to hurricane Gustav; that, coupled with new leadership, led to the drastic improvement in recovery efforts.
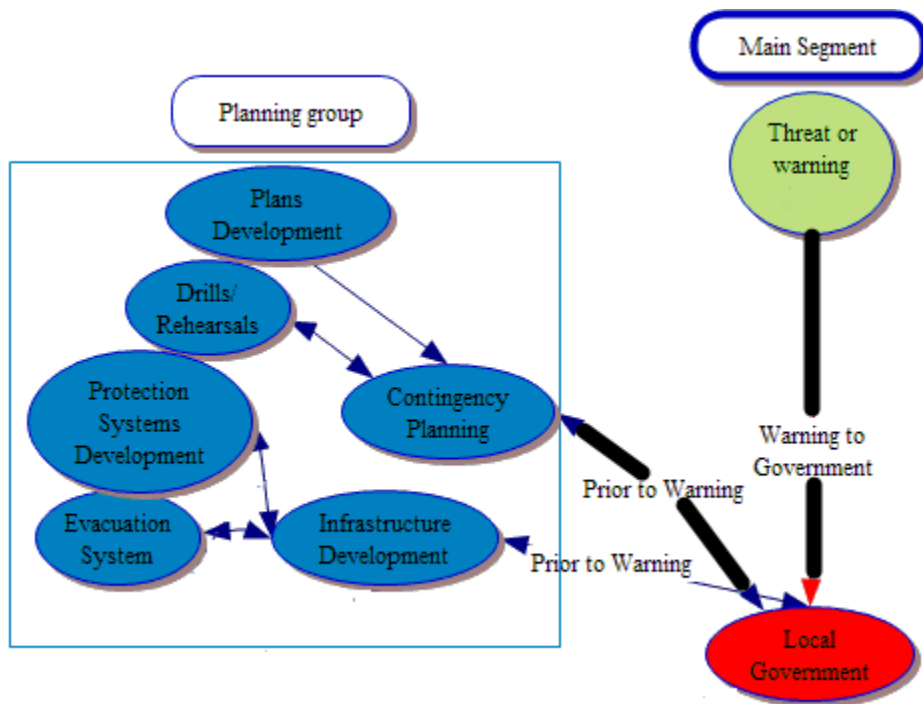
4.6) Hurricane Katrina Model Test:

This section serves as a sample test of the model and possible decisions that would be encountered during a disaster response. It follows some events from Section 4.5 that occurred during Hurricane Katrina to show how the model should be used. This section follows the planning group and government group sections of the model, illustrated in Figures 16 and 17

The threat of Hurricane Katrina was received before landfall as depicted by the top bubble in the model. The local government in New Orleans consulted plans. State highway plans had been developed based on 1998 and 2004 hurricanes but were not adequate for a storm as catastrophic as Katrina (NAE). There is a controversy surrounding whether a local plan existed

at all in New Orleans (Palast, 2006).

The Mayor of New Orleans decided to evacuate the city before the storm hit (Guiney, 2006). Consultations were made with higher levels of government but poor communication and coordination existed between the entities. Higher levels of government had very poor situational awareness going. Interaction among government groups was very poor. The communication linkages depicted by the model were not followed. This caused an uncoordinated response with an unfavorable outcome.

Figure 16: Planning Group Model
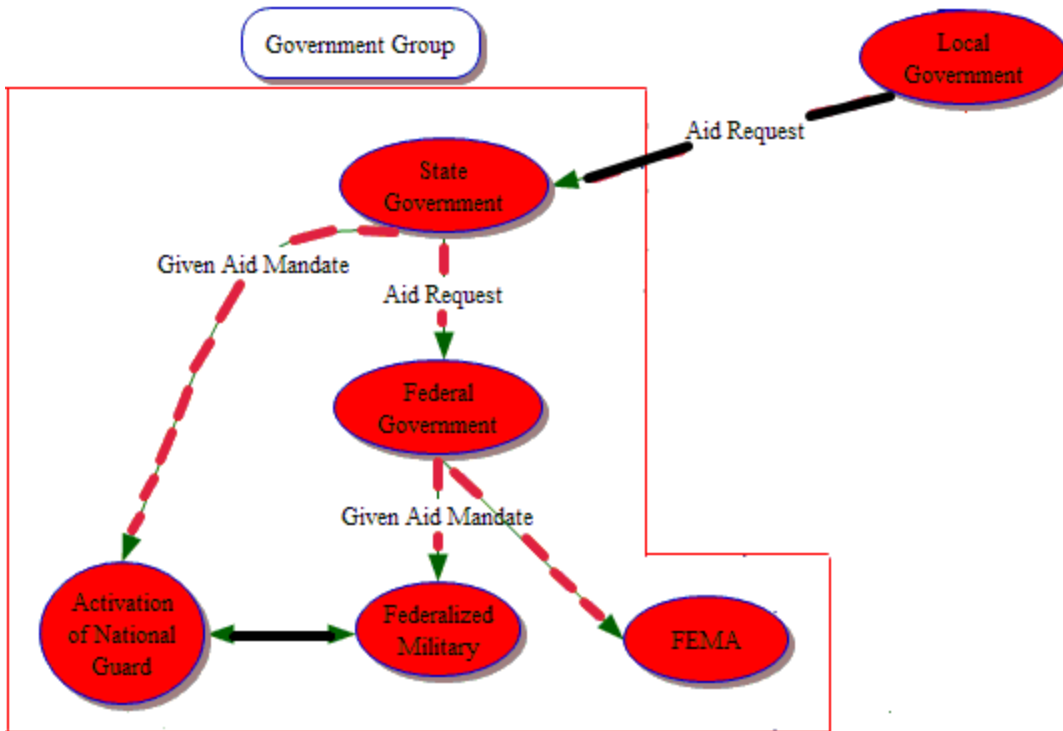
Figure 17: Government Group Model

4.7) Hurricane Gustav Model Test:

This section serves as a sample test of the model and possible decisions that would be encountered during a disaster response. It follows some events from Section 4.5 that occurred during Hurricane Gustav to show how the model should be used. This section follows the planning group and government group sections of the model, illustrated in Figures 16 and 17

The Threat of Hurricane Gustav was established at least six days prior to its landfall (LA Public Square 4). The local Government consulted plans that had been updated or improved since Hurricane Katrina as depicted in the model. The feedback arrow from the aftermath shows

where lessons learned were added to the plans, and lines depict the consultation of the local

government to the planning group. The Mayor of New Orleans (the local government) decided to

evacuate 2 days prior to the storm (Schafer, 2009). This decision was in the center of the model.

At the same time consultations were made with higher levels of government and all of the

different government entities were in communication with each other as depicted by the

connections between the different bubbles depicting government entities. For example, the

Louisiana State EOC activated 6 Days prior to landfall (LA Public Square 4). Coordination was

successful between different entities (Landrieu 3). The government was prepared for rescues in

case the situation deteriorated but it was not necessary. (MSNBC Staff, 2008).

In this case the model was followed and the outcome was relatively positive.

5.0) Analysis:

5.1) Analysis Framework

The following sections outline the framework that was developed from the material gathered through this project. These consist of the elements that make up a desirable planning group and government group, and these elements provide a base for analysis.

5.1.1) Planning Group Analysis

When evaluating the response to a natural disaster, the first step is to take a look at the planning and preparation for each incident that occurred. A well-established and detailed planning group is comprised of: engaged partnerships, tiered response, and a unity of effort though an integrated command (National, 2008).

Engaged partnerships are local entities interacting with one another and outside organizations to provide aid to the places it is needed. The needs and abilities of leaders at all levels need to be actively communicated and known so that in a time of crisis there is less confusion and leaders are less likely to be overwhelmed. The private sector must also be responsible for any support that is promised during a time of emergency, such as transportation, food, shelter, or other aid. As roles and responsibilities are defined, the ability to spread the responsibility between reliable sources reduces the strain on any one of those individual sources. Put simply, the more cooperation and understanding the better the outcome.

Tiered response is the escalation of resources per level of government. While disaster response may be the primary duty of local governments for first response, there are some instances that require the immediate attention of state and Federal government. Such would be

the case in a direct impact by a hurricane or major earthquake. Local government will not be able to manage the disaster alone. The ability of state and Federal government to take control of disaster management while keeping the interests of the local population in mind is essential to tiered response.

Unity of effort through integrated command is the centralization of command personnel in such a way that all information gathered is sent to them and all executive decisions come from them. The flow of information is key to the decision making process, as is integrated command. It is important for every incident to have one person with the responsibility and authority to direct tactical actions. When lacking a single authority, chaos easily arises on the basis of jurisdiction or miss-communication in multi-agency incidents.

The development of all mentioned aspects of a developed plan leads to the ability to act at a moment's notice. To have the training, resources, and initiative to provide aid in an automated response allows for a disaster management process to be the most successful it can be.

5.1.2) Government Group

Following the planning group, the government group must be investigated next when evaluating a disaster response. This group deals with all actions and decisions made by the local government, the state government, and the Federal government. An effective government group consists of: proper foresight, a unity of effort through integrated command, competent leadership, the ability to take initiative, and a lack of bureaucratic overhead.

Proper foresight involves making decisions that will be beneficial in the long term. Proper foresight is not so much temporary solutions, but rather more permanent plans. Potential

problems should be identified that could arise with different decisions and practical solutions need to be formulated for them.

Unity of effort through integrated command again is the centralization of command personnel in such a way that all information gathered is sent to them, and all executive decisions come from them. All commands need to come from a centralized control center and all information should flow to it. The centralized command is important because for every disaster response, one person or a small group of people should have the responsibility and authority to direct all actions. When a unified command is lacking, chaos easily ensues as the basis of jurisdiction is questioned or miss-communication among those involved ensues.

Competent leadership is needed at all government levels. A weak leader can often be the Achilles heel of an otherwise strong team. Leaders need to be experienced and qualified for their positions. Someone appointed to this position should have experience in this particular area and have proven they are effective. They should be appointed on the base of merit, not politics.

The ability to take the initiative involves taking actions when it needs to be taken. They should not be waiting around for an explicit order to do something when they already see it needs to be done. This can be anything from an implied task for their specific role in the disaster response to using common sense. For instance, if a field agent has a supply of drinking water in their charge and they are in an area with people who have not had clean water for weeks, the agent should take the initiative and distribute the water. This type of thinking should be used at all levels of a response, from the field agent to the state governor and beyond, though it's more important at lower levels in the chain of command.

There should be a lack of bureaucratic overhead in all government levels during disaster responses. Instead, a centralized, predetermined command structure should be set up and used to make all decisions and resolve all issues. This command should be free of all bureaucratic intervention. The command source should not have to alter their plans or decisions to meet the wishes of a politician or another official not directly involved with the disaster response. The command should be free to get the job done, not appease elected officials.

If these elements of a government group are present, leaders will be able to orchestrate a more efficient disaster response. Proper foresight, unity of effort through integrated command, competent leadership, initiative, and a lack of bureaucratic overhead all place capable leaders in positions where they can be most effective, using the tools given to them to accomplish their mission.

5.2) Final Analysis

Throughout the review of the material of this project, several trends became visible, such as the poor performance during Hurricane Katrina and then the improvement during Hurricane Gustav. The following sections provide a formal analysis using the analysis framework previously laid out.

5.2.1) Planning Group

There were no engaged partnerships reported during Hurricane Katrina. This does not mean that they did not exist, but if they did, they were not deemed noteworthy by anyone present to mention in later testimonies. Therefore, it can be assumed that if there were any examples of engaged partnerships during Hurricane Katrina, it was probably not very effective.

A tiered response was not effectively achieved during Hurricane Katrina either. The local government (The city of New Orleans) called to the state government (Louisiana) for aid in the days following Hurricane Katrina because they had overstretched their resources. The state government didn't have enough resources and the resources they had, they were not using effectively. The Federal government offered to send aid to Louisiana Governor Kathleen Blanco, but the Governor was slow to respond, wasting precious time. Basically, the local, state and federal level governments did not work together effectively.

There was also no unity of effort through an integrated command during Hurricane Katrina. This was not planned for at that time, and subsequently has become one of the key criticisms that have come from Hurricane Katrina. The different levels of government and agencies tended to worked independently with little cooperation at best.

5.2.2) Government Group

Proper foresight was strongly needed by all the levels of government involved. For example, there were no real plans for evacuating the city of New Orleans before Hurricane Katrina. When Katrina's impact was imminent, hasty plans were developed for the evacuation of the city. It was determined that everyone in the city was to leave by their own means. However, over 100,000 residents of New Orleans had no means to evacuate the city, and were forced to stay.

At the all the levels of government, there was no unity of effort through unified command. Leadership within FEMA, other agencies and all the levels of government were unable to agree on what the state of the situation regarding Katrina was at all times. This was caused by a lack of communications between everyone involved.

There was a lack of competent leadership during Hurricane Katrina as well. The outcome of the relief efforts was directly linked to the caliber of leadership at all levels. During Hurricane Katrina, leadership seemed to be failing at almost every level. Because the success of a relief was directly proportional to the competency of leaders involved, the relief proved highly ineffective. While there were incompetent leaders at all levels, the best example of one during this time would be Louisiana Governor Kathleen Blanco. Blanco openly refused aid to her state, even two days after the Hurricane, when the deplorable conditions of the Gulf Coast had been broadcast widely. Governor Blanco denied aid from several sources, most notably, the New Mexico National Guard who had been offering their aid since two days before the storm hit. When President George W. Bush flew to New Orleans to lend his personal assistance in the matter, he offered Gov. Blanco federal troops. Gov. Blanco said she needed 24 hours to make up her mind, further extending the cost of life and property in the wake of Hurricane Katrina.

There was also a strong lack of initiative on all levels of government involved. When FEMA agents in the field told their superiors about the deplorable situation they were in, they expected to be given step-by-step instructions on how to solve their problems. Instead of taking the initiative and providing the much needed resources they were entrusted with, FEMA agents did complete the implied tasks associated with their mission and waited for orders to take action. The leadership of FEMA further exacerbated this situation by not providing the agents in the field with proper direction or the proper resources to accomplish their relief missions.

Some bureaucratic overhead occurred during Hurricane Katrina. In an ideal situation, this should not be happening. The officials directly in charge of the disaster response should not be trying to appease bureaucrats when they should be spending their time on more important things, like getting aid to locations in need of it. An example of this is best stated by Gov. Bobby Jindal:

"During Katrina, I visited Sheriff Harry Lee, a Democrat and a good friend of mine. When I walked into his makeshift office I'd never seen him so angry. He was yelling into the phone: 'Well, I'm the Sheriff and if you don't like it you can come and arrest me!' I asked him: 'Sheriff, what's got you so mad?' He told me that he had put out a call for volunteers to come with their boats to rescue people who were trapped on their rooftops by the floodwaters. The boats were all lined up ready to go - when some bureaucrat showed up and told them they couldn't go out on the water unless they had proof of insurance and registration. I told him, 'Sheriff, that's ridiculous.' And before I knew it, he was yelling into the phone: 'Congressman Jindal is here, and he says you can come and arrest him too!' Harry just told the boaters to ignore the bureaucrats and start rescuing people"

5.2.3) Improvements with Hurricane Gustav

In regards to the framework that was previously laid out, Hurricane Gustav was a much more successful disaster relief than Hurricane Katrina. The drills and rehearsals conducted after Hurricane Katrina clearly had an impact on the success of the relief force for Hurricane Gustav.

The planning group had a clear improvement. The tiered response approach seemed to successfully work during Gustav. The increased emphasis on planning and rehearsals for disaster management that came after the failures during the Katrina relief efforts is visible in the scale and efficiency of the Hurricane Gustav relief efforts. Because of these extensive rehearsals,

crews were well practiced in their immediate actions and were able to much more effectively provide relief. Relief and rescue crews were stationed outside the immediate impact area and were given instructions to act as soon as the storm passed. All levels of the government and agencies worked cooperatively and accomplished their mission together, successfully putting into place a unified effort through integrated command. There were no engaged partnerships reported during Hurricane Gustav, though they were not needed as much as during Katrina, because the destruction associated with Gustav was much less than that of Katrina.

The government group also had a clear improvement. Proper foresight was used during Hurricane Gustav, partially in response to glaring inadequacies seen during Hurricane Katrina. The previous example during Katrina regarding the evacuation shows clear improvement. During the evacuation for Hurricane Gustav in New Orleans, bus pickup sites were located at various locations throughout the city to transport evacuees without transportation out of the city. As previously mentioned, the unity of effort through integrated command was much more successful during Hurricane Gustav. Leadership was also more effective. Competent leaders were located at all levels of the government during the disaster response for Hurricane Gustav resulting in a successful response. Leaders and officials took more initiative during Hurricane Gustav. This was because leaders in the field and command centers had better trained staffs and did not have to micro-manage their workforces. There were no reported cases of bureaucratic overhead during Hurricane Gustav, allowing the disaster response leadership to effectively do its job.

All of these factors fed into each other to produce a vastly more successful evacuation and relief effort than what occurred during Hurricane Katrina. With these major improvements, there is still room to improve. Recovery is even still taking place from Hurricane Katrina.

National Guard troops did not leave the city until 2009 (Foster, 2009). Disaster management

needs a high degree of planning, rehearsals, coordination, communication and leadership to be

successful. However, there is no way to be prepared for every possible event regardless of the

planning or leadership. Leaders must be prepared to expect the unexpected and be able to

improvise, adapt and overcome, much in the same way that military leaders are taught during

their training.

Table 2 shows a summary of the composition of a successful planning group and Table 3

shows a summary of a successful government group and if they were achieved during Hurricanes

Katrina and Gustav.

Table 2: Planning Group Analysis

Planning Group	Hurricane Katrina	Hurricane Gustav
Engaged Partnerships	None Reported	None Reported
Tiered Response	Not Achieved	Achieved
Unity of Effort Through Integrated Command	Not Achieved	Achieved

Table 3: Government Group Analysis

Government Group	Hurricane Katrina	Hurricane Gustav
Proper Foresight	Not Achieved	Achieved
Unity of Effort Through Integrated Command	Not Achieved	Achieved
Competent Leadership	Not Achieved	Achieved
Initiative	Not Achieved	Achieved
Lack of Bureaucratic Overhead	Not Achieved	None Reported, Achieved

6.0) Conclusion:

6.1) Conclusions

This goal of this project was to help set the framework for standard criteria that must be met for the successful execution of a disaster response at the local, state and federal government levels. In accomplishing this goal the project took into account:

- The decisions made at all levels of government as well as the criteria for those decisions

- The use and management of available recourses and their capabilities

- The escalation of command, authority, responsibility

- Interaction between different government levels

Through this project, a model of the decision making process during a disaster response was created, as is outlined in Chapter 5. The model consisted of two major groups, the planning group and the government group. It was determined that an ideal planning group includes decisions that demonstrate engaged partnerships, tiered response, and a unity of effort though an integrated command. An ideal government group consists of decisions that address proper foresight, a unity of effort through integrated command, competent leadership, the ability to take initiative, and a lack of bureaucratic overhead.

The analysis of the material gathered through this project resulted in the emergence of several visible trends in the decision making process during Hurricane Katrina and Hurricane Gustav. Competent leadership is needed at all government levels for a successful disaster response. Drills and rehearsals need to be scheduled and conducted. More initiative needs to be taken by officials in all government levels. There was a clear improvement the decision making

process during Hurricane Gustav compared to Hurricane Katrina, but there is still room for improvement. It has been realized that a perfect system is impossible to create due to the unpredictability of this type of work and the variables associated with it. Nevertheless, perfection should be strived for to insure the system functions as well as it possibly can. Performance of the system should always be analyzed after use, and further improvements identified and implemented.

There are several limitations to the analysis. First, the material gathered in this study does not cover every possible entity involved in a disaster response. There are agencies that have been overlooked or chosen to be ignored due to the time constraints of this project. These decisions limited the scope of the project to a manageable size. Second, the results and analysis of this follow from the authors' analysis of the compiled data, and another person tasked with the same study might develop different conclusions from additional data.

Through the results and analysis, several recommendations can be made for the disaster response decision-making process. The first recommendation is to make a plan. It is important to make a plan before beginning to give orders. Even if the event in question is something that could be anticipated and no plans are currently in place for it, a plan is still needed before actions can be taken. Once a plan is made, drills and rehearsals need to be conducted to ensure everyone involved knows what their job is and how to do it. Everyone involved in the disaster response should know what their job is and how they are to do it. This is especially important because no plan ever goes exactly as it should, but knowing what exactly needs to be done makes it easier for one to adapt to variables. Competent leaders are needed at all levels of leadership. Competent leaders know how to make the next two recommendations on their own. Decisions need to be

made. There were instances during the events of Hurricane Katrina when officials should have been making a decision, but did not. Even if it turns out to be the wrong decision, simply making one is generally better than sitting around and doing nothing. Another recommendation is that officials and agents on the ground need to take the initiative when they see it fit and not wait for the order. There were many times when an agent was waiting for their commander to give them the order to do something, when it was clear to them that it needed to be done with or without the authorization of their superior.

The implications of these recommendations may not be the most popular, but are very necessary. First, incompetent leaders need to be taken out of leadership positions and replaced by competent leaders. This simple action will probably address most of the other recommendations. Competent leaders will make a plan, make decisions, and will take the initiative. Making plans requires considerable energy at present to prepare for the future. It may seem like a waste of time now, but when it comes time to put that plan into action, not having one could result in catastrophic damage and loss of life. Like making plans, conducting drills and rehearsals take time and energy to efficiently do, but the knowledge gained from them is indispensable for any disaster relief.

The work done for this project has raised certain questions among the group that could possibly lead to other projects. First, this project's aim was to create a model for an evacuation in the event of a natural disaster. This project focused on a hurricane to create the model, but another group could take this model and apply it to another type of natural disaster. That project could then refine the model and improve it, making it easier to use for a broad number of natural disasters. This project also focused on a natural disaster that can be predicted and forecasted, but

another project could involve adapting this model to a natural disaster that cannot be predicted or forecasted, like an earthquake.

6.2) In Retrospect

During the course of the project, the project team learned a great deal about long term planning and organizing a large amount of material. Many of the lessons learned were due to mistakes made throughout the process. During the first term of the project (7 weeks), the team worked mainly on organizational issues that turned out to be of very little value. For example, the team developed several versions of pert charts for the various tasks that were developed. A lot of time was invested creating tasks that were never followed up on. After following a pert chart schedule for a week or two, the team stopped using it and found that it was more efficient to have an overall schedule for the completion of major sections, and work out the smaller details concerning the individual tasks as the project progressed. The team also went in circles regarding the direction of the project. However, developing the model during the first term was very valuable because as the model developed, the scope of the project was directly affected. The scope of the model eventually became the scope of the project. During this term, the project team rotated leadership on a weekly basis.

The second term was successful and most of the research was completed. Tasks were developed and distributed during group meetings. It would have been helpful to begin writing some segments of the report such as the introduction and background as well as the project methodology section. It may have also been helpful to outline the main body sections while the research was still fresh in the project team's mind. The team planned on finishing up the research during winter vacation but almost nothing was accomplished during it.

During the third term, the project team wrote the actual report. The team moved quickly during the first two weeks, but then became bogged down for a few weeks by doing repeated corrections without adding any new material. For a few weeks the project team questioned its ability to complete the project on time and then decided to do whatever it takes to finish. During the last few weeks of the project the team moved with an increased urgency and accelerated production of the paper dramatically until submission.

Looking back at the process, it may have been better to establish one leader from the beginning to settle disputes and ensure consistency. The team learned the difficulties of having leadership when the entire team was good friends with one another prior to the start of the project. Teams should discuss how this could affect the project at the beginning to mitigate some of the effects such as not being hard on each other when necessary.

The project was a good learning process for the team and the lessons learned will hopefully have a positive impact on the individual team member's future projects, such as an MQP.

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