Changing Geographies of Flood Mitigation Policies: A Case Study of Central, Louisiana

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CHANGING GEOGRAPHIES OF FLOOD MITIGATION
POLICIES: A CASE STUDY OF CENTRAL, LOUISIANA

A Thesis
Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Science

in
The Department of Geography and Anthropology

by
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B.A. University of California, Santa Cruz, 2012
May 2020
ACKNOWLEDGEMENTS

First, I would like to acknowledge the support of my thesis chair Dr. Craig Colten. I offer my gratitude for his unwavering patience and meticulous edits of the many drafts of this thesis. I especially thank him for his enthusiasm as he helped to ease my transition to graduate school and life at LSU with humor and encouragement. I would also like to thank my committee members Dr. Scott Hemmerling and Dr. Andrew Sluyter for their support of my project and for bringing their unique perspectives and experiences to the table.

Research reported for this project was supported by the Gulf Research Program of the National Academies of Sciences, Engineering, and Medicine and the Robert Wood Johnson Foundation. The associated three year research grant, Inland from the Coast, was organized by LSU Coastal Sustainability Studio (CSS). CSS also provided me with a GA position during the duration of my time at LSU and I thank my supervisors and the staff there, as well as all the other GA’s. Additionally I am grateful to the Department of Geography and Anthropology for awarding me a Robert C. West Graduate Student Field Research Award and to my fellow graduate students in the department for their support throughout this process as well as the departmental staff, Erika and Lauren. I would also like to thank the Southwest Chapter of the Association of American Geographers for the funds from the Graduate Poster Competition.

I am deeply grateful to the people of Central who welcomed me into their lives and shared their powerful and emotional stories. This research would not have been possible without their support. Lastly I would like to thank my family, for their patience and inspiration over the years and for always encouraging me to pursue whatever field I was passionate about.
ABSTRACT

In 2016, the Baton Rouge region experienced what would come to be record-setting precipitation levels. The 1,000 year rainfall event dumped almost triple the amount of water on Louisiana than was seen during Hurricane Katrina (some areas received over 10 inches of rain in a matter of hours), with rain persisting from August 12th until the 17th. Previously a part of Baton Rouge, Central is a relatively new development that expanded into the 100 year floodplain in 2005. This thesis will present the changing geographies of flood mitigation policies since a major flood in 1983 to the present, with particular focus on the lead up and immediate aftermath of catastrophic flooding events that occurred in 2016. Drawing upon interviews and review of public policies the thesis will show the paradoxes in government planning when it comes to safe versus economic development, summarize expressions of community opinion and input in flood planning, and compare them with policy change in recent decades. The results of this comparative analysis indicate a lack in evolution of government policy to match the speed of development into flood-prone areas, the recent growth in public expressions about flood safety and the importance of reconciling safe and economic development interests when implementing policy, especially at the local level.
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CHAPTER 1. INTRODUCTION: LOUISIANA AND WATER

1.1. Flooding and Development

Floods are among the world’s most destructive and commonplace natural hazards. They pose major threats to coastal communities and low-lying inland areas throughout the United States. In order to mitigate the risks, many local and state governments establish policies that facilitate acquisition of insurance and set construction requirements aimed at making buildings more flood resistant, but often see varied success rates. Massive efforts to redirect and mitigate floods have resulted in ambitious engineering efforts, not limited to New Orleans's extensive levee system and massive dikes and dams in the Netherlands. Such efforts continue as climate change continues to put pressure on exposed areas around the world.

In addition to understanding the physical exposure to floods, understanding vulnerability to flood hazards is key to being able to implement lasting solutions. Vulnerability is a term that can be used to cover many aspects of the human side of the hazard equation. Flood hazards have a varied impact on people, which are partly influenced by the socio-economic system they live in. Within a country or region, some communities are more vulnerable than others, and within some communities, individuals may be more or less sensitive. Those who are most vulnerable to the flood hazard may be unable to escape the risk or cope with the damages due to limited resources (money, knowledge, work flexibility, mobility).\(^1\) Vulnerability accounts for many of the different ways that people go about dealing with flood hazard, but it has several components. Exposure is an area’s location within an area that is prone to flooding.\(^2\) It can be understood as

\(^1\) David Homes and Croot, David. “Flood Risk and Human Vulnerability” in *Special Topics in Geography: Flood Risk and Management*, eds. Bob Digby and Sue Warn (Sheffield, UK: Oxford, 2010), 20-27

the physical geographical characteristics – location in a floodplain or in a mountain valley that receives ample precipitation. Human elements exposed within the system constitute susceptibility, such as the people or infrastructure that are most sensitive, which influences the probabilities of being harmed at times of hazardous floods. It includes the social context of flood damage, especially the awareness and preparedness of affected people regarding the risk they live with, the institutions that are involved in mitigating effects of hazards and the existence of measures to help assist during flood events, like evacuation routes.\(^3\) Resilience, or the capacity of a system to endure and recover from a hazard/disaster event while maintaining significant levels of organization in its social, economic, environmental, and physical components is vitally important for recovery from floods.\(^4\) This characteristic is evaluated best in places which have experienced past flood events, since the main metric is recovery.

A critical factor when it comes to the relationship between people and floodplains development is the paradox found in disaster policy. Raymond Burby introduces the idea of paradoxes, such as the contrast between policies that seek to foster either safe or economic development.\(^5\) Economic development prioritizes potential gains from increased real estate value and the associated tax revenue, even at the expense of environmental safety. On the other hand, safe development allows for floodplain development, but does so in a way that does not put undue risk on communities and places that are being developed. Burby outlines how local citizens often bear the brunt of human suffering and financial loss in disasters, while local officials pay insufficient attention to policies to limit their vulnerability or susceptibility. Burby

\(^3\) Ibid. 26  
\(^4\) T.J. Wilbanks, “Enhancing the Resilience of Communities to Natural and Other Hazards: What We Know and What We Can Do.” *Natural Hazards Observer* 32 (2008): 10-11.  
demonstrates in his article that in spite of the two paradoxes, disaster losses can be blunted if local governments pay attention to hazard mitigation at the local scale from the outset of the planning process, implying that community-led efforts are one of the best ways to deal with hazard planning.

1.2. The Case for Central, Louisiana and Research Questions

Most of southeast Louisiana has modest elevation, a dense stream network, and ample local precipitation. A large portion of New Orleans, encircled by levees, is below sea level. Even areas well inland – including highly populated areas – such as the Greater Baton Rouge area, stand only a few dozen feet above sea level and can expect previously unanticipated impacts from elevated storm surge due to rising seas and also heavier rainfall events. While residents of coastal regions are often aware of the risk they undertake by settling in these areas, issues of flooding are also a monumental problem in inland communities. We can look at the damage caused in Baton Rouge by the floods of 2016 for recent evidence of this. In 2016, the Baton Rouge region experienced what would come to be record-setting precipitation levels. The 1,000 year rainfall event dumped almost triple the amount of water on Louisiana than was seen during Hurricane Katrina (some areas received over 10 inches of rain in a matter of hours), with rain persisting from August 12th until the 17th. Looking back on this extreme event, some questions that remain include how the disaster might have been downgraded to a less serious flood through effective mitigation efforts since the last major flood in the Amite River basin in 1983. Thirty-three years is ample time for flood mitigation policies and infrastructure to be put in

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place to better protect communities from future events, yet there were lapses in the public response which left the region susceptible to a second major rainfall event.

Central lies in a particularly precarious position in the Amite River Basin (Fig. 1.1). The city is immediately upstream of the confluence of the Comite and Amite Rivers, with the two rivers making up the city’s southern boundary. In addition, most of the city lies in the 100-year floodplain.

![Figure 1.1. Study Area. Source: Map by Tanvi Shah, LSU Coastal Sustainability Studio](image)

As a whole, Louisiana has experienced a loss of 309 square miles of wetland from 1996 to 2010. This loss of land can exacerbate the effects of abnormally intense rainfall events in riparian basins that reach the coast. In addition, the high economic productivity in coastal areas (especially on the Gulf of Mexico) coupled with the rapid loss of protective marshland makes for

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large-scale problems on the coast, along with more intense storms associated with climate change that threaten more severe impacts. Loss of the coastal buffer, along with rising sea levels, will enable more direct impacts from tropical weather on areas now well removed from the shore. While many may think first of the coast when loss of wetlands is mentioned, it is important to note that riparian areas that lie further inland will also absorb some of these impacts of a loss in coastline. Rising seas and an elevation in storm surge will extend the risk inland.

![Figure 1.2. Projected Future Inundation from a 100 Year Flood Event with No Intervention](image)

*Figure 1.2. Projected Future Inundation from a 100 Year Flood Event with No Intervention*

*Source: CPRA’s 2017 Master Plan for a Sustainable Coast*

The Louisiana Master Plan for a Sustainable Coast showcases how land loss will affect the area surrounding Lake Maurepas (northeast corner of map, directly west of Lake Pontchartrain), which is the lower part of the Amite River Basin. In response to continued land loss and increasing flood risk and to improve the sustainability of the coastal landscape, communities, and economic future, Louisiana relies on the master planning process to define and implement projects that proactively address known and anticipated threats from rising seas. The graphic above asserts the level of inundation the area will experience if no steps are taken to address sea-level rise. Baton Rouge can be seen in the extreme upper middle of the map. Despite being 60

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5
plus miles from the Gulf of Mexico, the greater Baton Rouge area and the upper part of the Amite Basin will undoubtedly also feel the effects of a changing coastline.

Several things have changed in East Baton Rouge Parish since the devastating flood in 1983, including demographics and land-use practices, but some flood management policies have, unfortunately, stayed the same. For instance, the community of Central, Louisiana is a relatively new community that had developed in the 100-year flood plain and incorporated as a municipality in 2005 (City of Central 2018). Central differs from many of the communities immediately around it demographically and economically in that it is mostly made up of middle/upper middle class white populations. Since the community’s founding in 2005, the idea of place attachment has not become a major influence in decisions about remaining in flood zones as in coastal areas but the community is still incredibly tight-knit, as is common in Louisiana. It can serve as a unique case study of how current policy professionals, local officials, and city residents view development in the floodplain – 65 percent of Central is in the 100 year floodplain. This thesis will examine how changing flood mitigation policies affect the response to high water in the greater Baton Rouge area, focusing on how Central administrators have chosen to deal with future floods that will inevitably plague the city. In response to Raymond Burby’s 2006 discussion of disaster policy paradoxes, this thesis will address the following questions:

- Do local and federal government policies inhibit or enable development into the floodplain?

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• How have the policies effecting Central addressed safe versus economic development since the 2016 floods?

1.3. Methodologies

Qualitative methods provide the most appropriate approach to this topic. Qualitative researchers generally engage in studying real-world settings inductively to generate telling narrative descriptions and construct well-informed case studies. Inductive analysis across cases yields patterns and themes, which are the fruit of qualitative research. In the case of this geographical study it was important to me to not just understand the “what and how” of policy and institutional evolution and the public reaction, but also the “why.” Weimer and Vining suggest that the best policy analysis relies on case studies of the areas to be studied to demonstrate long term effects of proposed policy. They additionally assert that ideas that are politically feasible at the given moment in time may become so in the future if they are raised repeatedly enough and supported with sound evidence from case studies. With this “why” and importance of the proposed usefulness of case studies in mind, I rely heavily on interviews and also employ case studies to thoroughly analyze public policies. I utilized a significant amount of public data from the three parishes compromising my broader study area – Ascension, Livingston, and East Baton Rouge, focusing on the town of Central in East Baton Rouge Parish. I reviewed ordinances and policies that addressed residential and economic development in the floodplain and classified these policies according to their prioritization of either safe or economic development. In some cases, policies had pieces that fit both.

Before embarking on the analysis of policies, it was important to outline criteria that classified policies as either safe or economic. Actions taken by the city can be categorized as either reflecting economic development interests or safety interests; the table below classifies policies and actions accordingly (Figure 1.1). These definitions are built upon the ideas first presented by Raymond Burby in his discussion of government planning paradoxes in the wake of Hurricanes Katrina and Rita in New Orleans. He classifies the paradoxes as such: (1) in trying to make hazardous areas safer, the federal government in fact substantially increases the potential for catastrophic property damages and economic loss and (2) while their citizens bear the brunt of human suffering and financial loss in disasters, local officials pay insufficient attention to policies that would more effectively limit vulnerability. Safe development practices work to amend issues that stem from the second paradox, while economic development contends with the first.

The definitions depended upon for this thesis are more concrete. Safe development practices are most importantly categorized by engagement with the natural environment and direct interaction with local residents. Policies that uphold these practices should build with the natural environment and take natural processes into account, incorporate greenspace effectively and rely less on structural adjustments as a means to build into hazard areas. Economic development on the other hand is defined by its interactions with heavy structural adjustments and its prioritization of economic advancement at the expense of long-term community safety. In my analysis, I attempted to classify policies passed by the city of Central and Ascension, East Baton Rouge and Livingston parishes by these definitions. Rather than observe each law or policy as whole parts, I reviewed each as pieces of whole, defining sections and articles. Flood

hazard stipulations are often buried in policies that address larger issues, such as transportation and infrastructure development so this was necessary to most accurately capture all ordinances and policies.

Table 1.1. Defining Elements of Safe and Economic Development

<table>
<thead>
<tr>
<th></th>
<th>Safe Development</th>
<th>Economic Development</th>
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<tbody>
<tr>
<td>Builds with the environment, taking natural processes into account</td>
<td>Builds against the environment, not taking natural processes into account</td>
<td></td>
</tr>
<tr>
<td>Incorporates greenspace in flood hazard areas</td>
<td>Does not adequately incorporate greenspace</td>
<td></td>
</tr>
<tr>
<td>Less of a reliance on structural adjustments for long-term adaptation</td>
<td>Prioritizes economic advancement at the expense of community safety</td>
<td></td>
</tr>
<tr>
<td>Can come at the expense of potential economic growth, even though homes are safer</td>
<td>Heavier reliance on structural adjustments (i.e. flood walls, levees)</td>
<td></td>
</tr>
<tr>
<td>Residential areas may be much less densely populated, allowing for adequate runoff</td>
<td>in trying to make hazardous areas safer, the federal government in fact substantially increases the potential for catastrophic property damages and economic loss.</td>
<td></td>
</tr>
<tr>
<td>Housing costs may rise due to larger lot sizes and fewer homes in the area</td>
<td>Housing costs may be lower, due to more densely populated areas</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Author*

Many of the public policy documents were available online through MuniCode. However, since Central incorporated in 2005 and my research dated back to 1983, it was necessary to review earlier East Baton Rouge (EBR) Parish policies that guided development for the time period from 1983 to 2005. This required me to visit the EBR Parish court house several times to examine hard copies of older documents. I also did a fair amount of comparative analysis between East Baton Rouge and Livingston and Ascension parishes, which required trips to the respective parish seats of Denham Springs and Gonzalez as well. Disaster plans and Federal Emergency Management Agency (FEMA) maps were available through the
Cartographic Information Center (CIC) at Louisiana State University. These were utilized in an effort to understand how exactly the floodplain was developed and to look at how flood insurance has changed over time. I focused on issues that are lacking in floodplain management in the United States, especially the failure of mitigation procedures to contain increasing exposure to older buildings due to new development and the lack of local planning and mitigation for prior the encroachment of coastal influences. I additionally focused on the progression of zoning and development practices, specifically looking for information on subdivision development in relationship to major past floods. This was particularly important in Central, which incorporated in 2005. It was clear that there were several subdivisions were permitted in high hazard areas.

In addition to the analysis of public policies, I conducted a series of interviews to gauge local residents’ views on flooding, and if they had noticed policies change over the years. People lived in the territory that became Central in 2005 and were familiar with the landmark flood of 1983. Interviews enabled the collection of first-hand accounts of floods from earlier years. I used the snowball method to find interview subjects, where interviewees were able to recommend me to other residents who were willing to be interviewed. This method is particularly suitable when the population of interest is hard to reach and compiling a list of the population may be challenging; Central is a very tight-knit community, and I hoped that by relying on initial interviewees passing on information, I was able to gain a varied sample of truly invested community members.\(^\text{15}\) I began with local officials, first interviewing the Floodplain Manager for the city of Central and the Director of Public Works. From there, I was able to get in contact with other residents of Central, and I additionally put a press release in the local

newsletter, CentralSpeaks. Lastly, I contacted the science teachers at Central High School and was able to interview several of the teachers. I was able to interview a broad range of individuals, with ranges in education level, income, flood experiences, and involvement in civic activities.

It was also my intention to work with local government directly to see what local leaders perceived in terms of policy changes. I interviewed two former city council members and a sitting member of the United States House of Representatives and was able to discuss policy evolution and next steps as we look to the future of floodplain management in Louisiana. They were able to provide me with varying viewpoints outlining the formation of Central and the expansion of this northeast corner of East Baton Rouge Parish as a whole.

I was additionally able to utilize resources from the LSU Coastal Sustainability Studio (CSS), where I work. External funds support the Inland from the Coast Project, which is an interdisciplinary undertaking in the greater Baton Rouge and tri-Parish area. I benefitted from other participants in the study who were using several similar resources, such as zoning ordinances, flood ordinances, housing development and subdivision construction records to gain insight into how exactly Central has developed into the floodplain. Additionally by assisting in a set of scenario building workshops conducted in EBR and Livingston parishes, I was able to better integrate the policy analysis and interviews I conducted in Central. After conducting the interviews I worked to plug in what people’s perceptions around flooding meant. I looked to see how their actions and words following the floods had been translated into policy. This was done by looking for common themes in the interviews such as opinions on state/federal support, length of time they had resided in the area and prior experiences with flooding.
CHAPTER 2. LITERATURE REVIEW: FLOOD POLICY, RESILIENCE & CASE STUDIES

This literature review contains three distinct subject areas on flood risk and mitigation. First, it focuses on national flood management policy, centering on the origins of floodplain management with the eventual passage of the National Flood Insurance Act of 1968 and the subsequent formation and progress of the National Flood Insurance Program. Prior to these measures, the majority of floodplain management was: (a) conducted on a local level and (b) highly focused on structural fortifications, as discussed in the works of Gilbert White and his students. Their work acts as a springboard for the analysis of future flood policy in the United States. Second, I dissect the existing literature on community resilience and examine the role that memory studies can play in foregrounding the experiences and responses to past floods and their incorporation in legislative policies, especially on a local level. Lastly, the literature review covers a variety of case studies of floodplain management seen in specific U.S. cities and in response to specific events such as flooding in Tulsa, Oklahoma, Rapid City, South Dakota, Ellicott City, Maryland and the 1993 Mississippi River floods. To best analyze this body of work, I will rely upon floodplain manager’s literature as well as case studies from the time of occurrence. This literature comes together to help answer the questions of safe vs. economic development and to better analyze flood hazard mitigation policies.

2.1. History of Floodplain Management: An Academic & Policy Framework

Gilbert White and his contemporaries are regarded as the parents of floodplain management in the United States. In his most famous work, White covers the classification and identification of adjustments to flooding in the United States, perceptions of natural hazards, and
choice of natural hazard adjustments. Adjustments to flooding are defined as either structural or nonstructural. He advocated, where feasible, a shift away from the structural solutions that dominated policy in the early twentieth century. These structural adjustments, developed by engineers, seek to protect humans from the risk of inundation and enable them to continue living in flood prone areas. White's non-structural adjustments advocated for policies imposed by a governing body (local, regional, or national) to restrict the use of floodplains, or human adjustments to flood risk that do not involve heavy investment in flood controls, such as developing infrastructure to accommodate natural processes and rather promoted adhering to safer long-term development policies. In his influential dissertation entitled "Human Adjustment to Floods," White argued that an overreliance on structural works in the United States had increased, rather than decreased, damage from flooding. In short, public confidence in structural works increased occupancy of, and the pace of construction on, floodplains. He argued in this work – deemed by several commentators to be the most important contribution made by a geographer in twentieth-century North America – that "floods are an act of God, but flood losses are largely an act of man."

Design standards are sometimes inappropriate or inadequate based on short-term flood records and foster overconfidence in structures, resulting in catastrophic infrastructure disasters.

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17 Ibid. 130
if a flood breaches hard defenses. A recent and relevant example of the impacts of undue confidence in structural works can be seen in Hurricane Katrina’s impact on New Orleans, during the summer of 2005. Historically, at least in the U.S., certain design specifications had to be met (for example, to adhere to the 100-year flood requirement). In instances where high water exceeds the design specifications (in the case of a 150-year flood), the levees have failed, thus causing catastrophic loss in overdeveloped floodplains. In their landmark work, The Environment as Hazard, Burton, Kates and White make the case for adjustments as a way to adapt to flooding in certain areas without turning to structural methods. These so called “adjustments” are ways to mitigate flood impacts both proactively and retroactively. However, while the themes the authors cover relating to the development (or rather, their pursuit of more limited development) of the floodplain are well founded, they make several assumptions about human behavior that still effect how these ideals are actually carried out even today. In the best-case scenario it may be that adjustments, whether in resource use or hazard mitigation, come mostly from "the ways people (1) recognize and describe specific hazards, (2) consider how they might deal with it, and (3) choose among the actions that seem available to them.” This view has potential for problems to arise as it can be difficult to predict how people will react and make decisions in times of disaster. They also discuss “bounded rationality,” acknowledging that rationality can be limited by a variety of factors such as the time available to make the decision, the actual cognitive limitations of the mind and the seriousness of the problem. In the ideal of Herbert Simon and collaborators, people are sometimes looking for the most satisfactory solution

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24 Ibid. 45
rather than the most optimal or rational one.\textsuperscript{25} I believe it is safe to say that in times of crisis, humans are less likely to be rational.

Prior to 1968, flood policy in the United States was in existence but varied in its effectiveness. In 1917, a flood control act was approved that appropriated $45 million for a long-range flood control plan of the lower Mississippi and Sacramento Rivers (leaning heavily on only levee construction), however, the 1927 Great Mississippi River Flood showcased the problems with the “levees only” policies that were enacted earlier, prompting further amendments.\textsuperscript{26} Responsibilities of flood recovery generally fell on individual citizens, or at most on local governments. A coordinated response was not the norm or common until 1950 when the Disaster Relief Act of 1950 was passed, which provided a framework for regular assistance when necessary to states from the federal government.\textsuperscript{27} Prior to this disaster relief was common, but strictly on a case by case basis, with no real unifying element.\textsuperscript{28} This was critical in that it created the first permanent system for disaster relief without the need for congressional action. Flood policy continued to ramp up through the 1950s and while the U.S. had seen a long history of loss of property and life due to flooding, renewed continuous demand for federal reform did not come until after Florida and Louisiana suffered immense damage after Hurricane Betsy in 1965.\textsuperscript{29} While White had lobbied for flood insurance for years, Knowles and Kunreuther outline how Congress’s National Flood Insurance Act did not unfold as Gilbert White would have wished it to. After the 1965 storm, Congress called for the formation of the “Task Force on Federal Flood


\textsuperscript{27} \textit{Ibid.} 4

\textsuperscript{28} Craig Colten, \textit{Southern Waters: The Limits to Abundance} (Baton Rouge, LA: LSU Press, 2014).

Policy,” chaired by White, to study the issue and make recommendations.\textsuperscript{30} White’s report
stressed that flood insurance should serve a dual purpose: not only to offer financial relief to
flood victims, but also to take a lead role in directing land use and development—or rather
restriction of development—in the nation’s floodplains.\textsuperscript{31} The report was optimistic, suggesting
that with a comprehensive effort at studying floodplain management, a flood insurance program
could take hold and succeed. Congress did not heed this advice and did not adequately address
land use and development and passed the National Flood Insurance Act well before White felt it
was ready.\textsuperscript{32} The most prominent thing to rise out of the National Flood Insurance Act was the
creation of the National Flood Insurance Program (NFIP). While it was clear that some form of
federal management was deeply needed, the NFIP has proved to be a controversial solution for
many. Major amendments were made to the act in 1969, 1974 and 1994.\textsuperscript{33} More recently, the
passage of the Biggert-Waters Act in 2012 was divisive and has required further amendments in
the form of the 2014 Homeowner Affordability Act.\textsuperscript{34} Even now the NFIP flounders; debt ridden
and viewed warily by those who live in the floodplain, always unsure what help will come
when they are affected. The truth of Gilbert White’s predictions that it would not succeed unless
a smaller amount of attention was focused specifically on providing federally subsidized flood
insurance and more attention be directed to the comprehensive management of development on
the floodplain persists to the present day.

\textsuperscript{30} Scott Gabriel Knowles and Howard C. Kunreuther. "Troubled Waters: The National Flood Insurance Program In
\textsuperscript{31} Ibid. 329
\textsuperscript{32} Ibid. 331-332
\textsuperscript{33} FEMA. Significant Flood Events. (2019) Accessed 23 September, 2019: https://www.fema.gov/significant-flood-
\textit{events}
\textsuperscript{34} T.A. Marshall, Colten, C. E., and Hijuelos, A.C. National Flood Insurance Program: Impact of the Biggert-Waters
Flood Insurance Reform Act of 2012. Funded by the Coastal Protection and Restoration Authority under Task Order
The program’s implementation was a long time in the making and had two main goals at the time of its inception: (1) To provide flood insurance for structures and their contents in communities that adopted and enforced an ordinance outlining minimal floodplain management standards and (2) To identify areas of high and low flood hazard and establish flood insurance rates for structures inside each flood hazard area. Defining the areas of high flood hazard, or the floodplain, is one of the biggest debates in floodplain management. The Federal Emergency Management Agency (FEMA) received the mandate to define the floodplain. Land area that would be inundated by a base flood (the flood area that has a chance of being equaled in a given year) is considered the floodplain. This is also commonly known as a 100-year flood – or the area with a 1 percent chance of flooding each year. The National Flood Insurance Act and the NFIP refer to these areas as “special flood hazard areas” or SFHA’s. These areas are susceptible to floods, and thus are likely to endure repeat flooding. The NFIP has covered more than 30,000 “severe repetitive loss properties” (SRLPs) across the United States. These properties have flooded an average of five times, according to FEMA. The NFIP funds rebuilding in place, and the absence of an alternative formula is a costly component of the NFIP. Homeowners might prefer to relocate to higher ground in some cases, which would spare them the trauma of enduring and recovering from repeat flooding. This would also spare taxpayers the expense of rebuilding the same properties after every flood. But the NFIP’s current structure does little to incentivize this approach as discussed in a July 2017 NRDC (Natural Resource Defense Council) report. Most NFIP assistance goes toward elevating homes on pilings or

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38 Ibid. 3
raising their foundations, though some assistance still does go to homeowners. As sea levels rise in coastal areas and larger floods become increasingly likely along inland rivers due to more copious rainfall, increased elevation may only serve as a temporary fix. The number of flood damage claims paid by the NFIP would be lowered by buyouts and would also enable homeowners and their families to move to safer neighborhoods and avoid the hardship of additional floods. Relocation is a potential solution that falls in line with safe development principles.

Participation in the NFIP is based on an agreement between local communities and the federal government that asserts that if a community will adopt and enforce some sort of floodplain management ordinance of their own design (that also meets federal standards) to reduce future flood risks on new construction in SFHA’s, the federal government will make flood insurance available within that community for financial and property security. Flood Insurance Rate Maps (FIRMS) depict SFHA’s and other risk premium zones in participating communities. These maps are readily available to the public. The initial goal of this system was to provide a consistent method for delimiting and alerting the public to flood risk. Ultimately these maps would help to lower future flood damage by providing protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for that protection and through community floodplain management ordinances. However, a report from the General Accounting Office (USGAO) in 2003 exposed that repetitive loss properties actually cost the program about $200 million annually. When Congress first passed the NFIP,

39 Ibid. 5
40 Ibid. 5
the goal was that flood insurance premiums would cover operating expenses and flood insurance claims. However, as Kriesel and Landry state, the NFIP ends up borrowing from the U.S. Treasury at times when losses are heavy and the loans are subsequently paid back with interest. Storms that inflict significant damage and require significant insurance claims, such as Hurricane Katrina in 2005 and Superstorm Sandy in 2012, test this financial arrangement.\textsuperscript{43} Between 1978 and 2014, the U.S. federal government paid more than $51 billion in claims under the National Flood Insurance Program; as of 2019, the program had accumulated $25 billion in debt.\textsuperscript{44}

Congress had modified the program through a series of amendments over the years. During its first decade, there was low subscribership. Kriesel and Landry assert that when Congress created the NFIP, people still believed strongly in self-insurance or adaptation strategies and were distrustful of formal federal insurance, especially in small coastal communities that we see in Louisiana.\textsuperscript{45} The first major amendment came in 1973, which made the purchase of flood insurance mandatory for property owners in participating communities as a condition to receive federal financial assistance within the SFHA’s.\textsuperscript{46} Later came the National Flood Insurance Reform Act of 1994 which set up the Community Rating System (CRS), an incentive program that encourages communities to go above the minimal federal requirements for limiting floodplain development.\textsuperscript{47} Landry reaffirms the ideas of Gilbert White by stating that extensive development in floodplains and a high rate of population growth in low-lying and coastal areas have increased human beings’ exposure to flood hazard. He suggests that the

\textsuperscript{46} Ibid. 409
communities that implement hazard mitigation planning and management activities recover faster from disaster than those communities that do not, are less prone to flood hazards and that the CRS does in fact have an impact on encouraging individual communities to proactively plan for flood damage.\textsuperscript{48}

Major and controversial reform came in 2012 with the passage of the Biggert-Waters Flood Insurance Reform Act. Prior to Hurricane Sandy in 2012, the NFIP’s debt rang in at about $17 billion.\textsuperscript{49} One of the main reasons for passing Biggert-Waters was to ensure that the premiums matched the flood insurance payments, transitioning away from the common practice of charging subsidized, or artificially low rates, which made the program actuarially unsound.\textsuperscript{50} The changes to the NFIP imposed by the Biggert-Waters Act produced major increases in insurance premiums to individuals, causing a large stir on the national stage. Shortly after Congress the Biggert-Waters, The Water Institute of the Gulf published a report outlining some of the projected changes that would result. Based on its findings (centered on a study of insurance rates in Fargo) they suggest property owners and local policy makers feared that the impending increase in insurance rates might render some properties un-marketable in the future and constitute a serious threat to the long-term value of property, the real estate market, local businesses, lending institutions, and entire communities.\textsuperscript{51} While the full extent of the act had yet to be determined, the risk of future strain on the reserves and resources in the system continues to be a concern as outlined in the 2013 GAO report on the state of the NFIP.\textsuperscript{52} The outcry following

\textsuperscript{48} Ibid. 217
\textsuperscript{50} Ibid.
\textsuperscript{51} Ibid.
the passage of the Biggert Waters Act led to the subsequent passage of the Homeowners Flood Insurance Affordability Act of 2014. While academic literature on the impacts of this act specifically are lacking, Carolyn Kousky, of the Wharton Risk Center, published a report on premiums and homeowner affordability soon after its passage. The factors that influence NFIP full-risk premiums vary by flood zone, such as elevation above base flood elevation (BFE), whether or not a basement exists, and the type of property. The GAO raised concerns that some of the data used in FEMA modeling were outdated or inaccurate prior to the passage of either aforementioned act. FEMA continually works to update FIRMs and make other improvements, but certain items, such as probability estimates of floods of different magnitudes, have not been updated in decades.53 This exposed the need for reform. Starting in 2015 (after the Homeowner Affordability Act was passed) FEMA put in place limits to keep insurance spikes below 18 percent per year and discounted rates were made available upon application.54

Flood policy in the United States has followed a long and winding road. The transition from self-implemented adjustments and insurances to large scale flood policy on the national stage came at a time of remarkable population change and upheaval in how people develop the coast and riparian floodplains (with the speed of development contributing to a proclivity towards economic development practices). Throughout the development of these policies in the U.S., we have seen the persistence of the ideas presented by early academics, such as Gilbert White. These ideas of not just limiting, but changing how we develop the floodplain, are critical to moving forward flood policy on the national stage. While economic priorities may have been

the norm in the past, we must work to implementing safer development policies as we move forward.

2.2. On Memory, Resilience & Collective Action

Social memory has been summarized by historians as the “community’s collective values, beliefs, and practices as expressed though the creation and retention of particular narratives about the past.” Adger defines resilience as the ability of groups or communities to deal with with external stresses and disturbances as a result of social, political, and environmental change. This literature review first considers the early contributors in social memory studies and its origins in psychology and sociology. I then outline the growth of resilience studies in the geographic discipline, focusing on its ability to be used as a call to action for communities. I use this as a starting point to examine how geographical scholarship has more recently presented social memory (or “collective memory”) and resilience in diverse ways to produce measurable change in relation to natural hazards mitigation. I also discuss ideas of place attachment and collective local action in the context of flood hazard mitigation schemes.

Most modern usages of the term “social memory” find their roots in the work of Maurice Halbwachs and his work, On Collective Memory. He argues that while it is individuals who remember, they rely on a specific group context, whether it is social class, family, or trade union, to remember elements of the past. In this book Halbwachs engages with the ideas of philosopher Emile Durkheim. They differ in their discussion of “collective effervescence,” which Durkenheim centers around ceremonies such as festivals and dances, whereas Halbwachs

sought to explain what binds people together in the everyday, arguing that collective memory fills the gaps between these “effervescent” periods. When it comes to flood mitigation, those periods between times of “effervescence” are critical in the utilization of a collective memory. Mitigation measures are most effectively enacted proactively, between times of large-scale disasters, not right after a catastrophic event occurs. This can become problematic as a sense of urgency erodes as you move further away from the time of disaster – memory loses its power. One of On Collective Memory’s most prominent themes is that “memory is not benign, but is a tool used in the active reconstruction of the past in an image that corresponds with the needs of the present.”

It is in the hands of societal groups to revise their past; this is especially applicable to the field of natural hazards research. Halbwachs also shows how our collective conscious can sometime distort past events: “Society from time to time obligates [that] people not just reproduce in thought previous events of their lives, but also to touch them up... we give them a prestige that reality did not possess.”

For the purposes ascribed to this thesis, social memory can be used as tool for action. However, to be successful in this endeavor, researchers and local community members alike must be careful not to ascribe traits to an event in an effort to fit the needs of the time. In other words work must be done to ensure that memory is utilized in as objective and accurate a way as possible.

Sociologists Jeffrey K. Olick and Joyce Robbins, who penned “Social Memory Studies: From ‘Collective Memory’ to Historical Sociology of Mnemonic Practices,” point to other explanations for the increase in public interest in memory over the twenty years. They state that the most significant influences on public interest are the lingering aspects of 1960s-1970s political culture which identified historiography as a source of cultural upheaval, challenged the

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58 Ibid. 22
59 Ibid. 26
conceptual roots of a linear portrayal of history and “truth,” and reflected a renewed interest in socially based theories of memory use.\(^6^0\) The next work of critical importance to the field is James Fentress and Chris Wickham’s book, *Social Memory*. It is a challenge to Halbwachs’ central notion that memory is mostly collective and structured by group identities. Fentress and Wickham believe that this collectivized focus has neglected the importance of individual consciousness.\(^6^1\) They are directly concerned with public and social aspects of memory, including the formal recreation and memorialization of the past, which are prominent themes in the field also suggested by other scholars. The experiences of individual people in a community are just as important to memory studies as are the collective efforts of a whole group of people. We can look forward the case studies presented in the next section of this literature review to see this. As Rahn remarked in his paper, it was the actions of individual dedicated local government officials that helped get the idea for the Rapid City greenway off the ground and sustain long-term public support. But as the 1972 disaster moves further into the rearview mirror, people are beginning to forget. The city now faces pressure to build additional buildings along the greenway that will reduce the efficacy of the flood control efforts.\(^6^2\) Perhaps the memory of the flood is no more than 25 years, or just beyond one generation’s recollection?

Geographers have utilized social memory studies across a vast array of individual disciplines, especially in partnership with issues of resilience. Thomas Wilbanks defines resilient communities as those regions that maintain four key elements that enable: the ability to anticipate disruptive events, the capability to respond to them effectively, the mechanisms to recover from them equitably and efficiently, and take steps to reduce vulnerabilities to future

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events. Memory is a means to meet a more resilient future. Memory can be active; it is passed down over generations and ensures that essential knowledge and traditional ways of life remain a part of the present. Communities in Louisiana have persisted in precarious places for much of the states’ history, whether it is the hurricane prone communities on the southeast coast or inland communities that face the constant threat of river floods. The endurance of these communities is an indication that ideas of resilience were inherent even before the academic study and applications of the concept began. A major concept in resilience studies is that human societies can use their accumulated social memory to better contend with future catastrophes by applying what they have learned from past hazard events. In their paper “Social Memory and Resilience in New Orleans,” Colten and Sumpter suggest that a lack of reliance on social memory played a role in the devastation caused by Hurricane Katrina. Following the devastation brought by Hurricane Betsy in 1965, New Orleans took remarkable steps to attempt to increase their resilience and reduce their vulnerability to future storm of similar strength. Congress almost immediately set in motion the first major project to reduce future hurricane impacts. It appropriated funds for the Corps of Engineers to begin detailed planning and construction of a massive hurricane protection system for southeast Louisiana – the infamous levee system which failed 50 years later during Hurricane Katrina. The levee system created a false sense of security and allowed people to heavily develop the floodplain, causing them to forget the destruction brought in 1965. Resilience resides, in part, in the ability to draw on past

63 T.J. Wilbanks. “Enhancing The Resilience Of Communities To Natural And Other Hazards: What We Know And What We Can Do.” Natural Hazards Observer (2008): 32:10-11.
65 Ibid. 358
experiences and is inherently historical – both formally and informally. Countries, communities, organizations and individuals are all subject to a diverse and ever changing environment. The threats that this sometimes turbulent environment poses can vary in both severity and frequency and require the expertise local to a specific area to learn and grow from past natural hazards.\textsuperscript{68} Raymond Burby introduces the notion of government policy paradoxes in his landmark work on government response to disasters.\textsuperscript{69} As mentioned earlier, this work presents the two main paradoxes that plague governments when it comes to hazard risk reduction; the safe development and the local government’s paradox. He makes the case that no matter how well intentioned policies are out the outset, if they set communities up for catastrophe down the line, they are making it extremely difficult for communities to exhibit resilience to storms.

Perhaps most relevant to the work in this thesis is the idea of “sustainable flood memory” put forth by McEwan. She defines this memory as community focused, archival, integrating individual/personal and collective/community experiences.\textsuperscript{70} It subsequently addresses the unique battle between memories of past flood events and their role in changing hydrological and socioeconomic environments. Her research projects explore how the concept of memory can help understand processes of informal social learning and community that might be supported in flood risk management, and how this may strengthen community resilience to future floods. She asserts that a focus on memory can stipulate a more dynamic outlook on the relationship between


past and future floods.\textsuperscript{71} Better integrating local knowledge into flood recovery efforts requires this kind of adaptive and fluid knowledge.

Ideas of social resilience in academic literature rose from previously established ideas and works on ecological resilience. Perhaps the most prevalent work on ecological resilience, Holling’s \textit{Resilience and Stability of Ecological Systems} asserts that resilience is dependent on gradual change of an ecosystem.\textsuperscript{72} He raises the point that quantitative changes to ecosystem stability can both be a result of and influence qualitative changes on the human scale. Resilience has a variety of interpretations and definitions. It is the buffer capacity or the “ability of a system to absorb perturbations, or the magnitude of disturbance that can be absorbed before a system changes its structure by changing the variables and processes that control behavior.”\textsuperscript{73} By contrast other definitions of resilience emphasize how quick the recovery is after a disturbance, highlighting the difference between resilience and resistance, where the latter is the extent to which disturbance is actually transformed into a tangible impact.

Adger later proclaims that a link exists between social and ecological resilience, particularly for social groups or communities that rely on ecological and environmental resources for their livelihoods.\textsuperscript{74} His article examines whether resilience is a useful characteristic for describing the social and economic situation of social groups and examines where links between social resilience and ecological resilience take shape, the roots of which he states are in human

\textsuperscript{71} Ibid. 3
\textsuperscript{74} Neil Adger. "Social And Ecological Resilience: Are They Related?," 351.
ecology, ecological economics and rural sociology.\textsuperscript{75} He also reminds academics that resilience functions in conjunction with issues of vulnerability. He additionally emphasizes that social memory lives with people, institutions and places, and it that it results from the combined effects of knowledge, skills and experience that make up a community’s memory. Susan Cutter defines vulnerability as the potential for loss following a triggering event.\textsuperscript{76} If a community is particularly vulnerable to a certain type of hazard then their resilience or ability to recover would certainly decrease. This type of research should work to mediate vulnerability and promote adaptive action and resilience. Cutter also states that while vulnerability as potential exposure or social response pervades the existing literature (especially at that time), a direction emerged that combined elements of the two, but it was inherently more geographically centered. In this perspective, vulnerability is conceived as both a biophysical risk as well as an indicator of sensitivity to risk, but within a specific areal or geographic domain.\textsuperscript{77} This could relate to geographic space (where vulnerable people and places are located), or social space (who in those selected places are most vulnerable).

2.3. Case Studies

As demonstrated thus far, problems associated with flooding are not new issues in the United States. Cities that lie along rivers across the country face these potential hazards from the forces of nature and resources that also sustain them. The literature on flood hazards is bursting with evidence of rising annual flood losses despite increasing federal spending on engineering protection works and of calls for new options to help create a social structure capable of

\textsuperscript{75} Ibid.
\textsuperscript{76} Susan Cutter. ”Vulnerability to Environmental Hazards.” \textit{Progress in Human Geography} 20, no. 4 (1996): 529-539.
\textsuperscript{77} Ibid. 330
modifying human behavior in ways likely to decrease rather than increase flood loss potentials.\textsuperscript{78} This issue is discussed at length on the national stage, but before one can jump into looking at better ways to reconcile different flood mitigation strategies in Louisiana specifically, it is imperative to have an understanding of what has not proven successful elsewhere in the United States. I have selected literature focusing on areas that have either established “successful” flood mitigation strategies or have similar characteristics and problems that we see in southeast Louisiana, especially in inland communities.

Tulsa is often discussed as the crowning jewel of flood mitigation works in the United States. Its “greenway” is enviable and the turnaround following a history of floods in the early to mid-1900s is remarkable. Its development of a mixed mitigation scheme including both structural and nonstructural controls along Mingo Creek is of particular interest. Meo, Ziebro and Patton explore the ties between policy innovation and community-led action and how these things came together to encourage an overall trend towards sustainability on a large scale in Tulsa.\textsuperscript{79} Their work cemented the idea that large-scale change and innovation came from the dedication of a few persistent individuals. Observation of specific strategies implemented was also crucial.

Tulsa’s transition away from repeat flood victim began following the 1984 Memorial Day flood, which saw over $180 million in damages for the city.\textsuperscript{80} Tulsa adopted an innovative program that enabled the city, in partnership with the U.S. Army Corps of Engineers (USACE), to design and construct a flood control system made up of a network of landscaped detention

\textsuperscript{80} City of Tulsa. “Flood Control.” Accessed 23 October 2019
https://www.cityoftulsa.org/government/departments/engineering-services/flood-control/flooding-history/
basins along Mingo Creek, land-use reforms and leadership changes in local city government that have helped the city become a leader in flood hazard mitigation in the nation. In his 2001 paper, Meo asserts that the reason that Tulsa found success in its mitigation programs can be attributed almost entirely to the actions of several so called “strategic policy innovators.” Meo references the works of early scholar Kingdon in his examinations of the early roles of innovators in local government. Kingdon notably argued that conditions for innovation in government are most favorable when local politics, the problem at hand, and policy momentum come together at a “window of opportunity.”

The biggest benefit in the Tulsa procedure appears to be the sustained support of the voting public in the years following each bout of flooding the city endured. Meo proposes that the main “window of opportunity” that the city seized was that which followed the 1984 floods, but I would suggest that Tulsa succeeded because of the incremental but noticeable success they saw as a result of their efforts over a long period of time (and a consistent, dedicated funding stream). This is supported by Anne Patton, an instrumental member of the team that built up Tulsa’s flood-control and hazard mitigation programs, who in her 1994 article states that change began in 1984 with the formation of the advocacy group Tulsans for a Better Community, ramped up in 1990 after a change in the organizational makeup of Tulsa’s city government (a switch from commission to mayor-council form), and culminated in 1997 with a collaboration with the Federal Emergency Management Agency (FEMA) that resulted in the grant that would become known as Project Impact. Project Impact’s biggest strides were made in solidifying

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82 Ibid. 98
public-private partnerships and in conveying the importance of pre-hazard planning practices. After the Project Impact grant expired, the city and other private sponsors continued to fund the programs that had been set up, having recognized the importance of continuity. By 2000, the city had helped to establish the 501-C-3 program Tulsa Partners Inc. which now permanently works to mobilize public and provide donation sources and create new and innovative programs. In short, the Tulsa method is sustainable – something that is not always seen in flood control and mitigation plans.

Rapid City, South Dakota is another example of a place that has risen above its flood problems and created lasting solutions. Following the flood of 1972, the floodplain redevelopment included prioritizing a greenway along the creek and public open space to accommodate floodwaters. The well implemented and innovative management scheme received widespread praise. The city’s greenway is considered an outstanding example of efficient multi-objective use space in a floodplain.

The Black Hills make Rapid City and its surrounding communities susceptible to extreme flooding. There is often little time to warn residents of flood threats since rainfall usually is intense and over steep watersheds. In 1972 catastrophic rainfall amounting to about 15 inches in 6 hours befell the Black Hills neighboring Rapid City. The rains caused record-breaking

85 Ibid. 91
86 Ibid. 93-94
floods on streams draining the eastern slopes of the Black Hills and caused a reservoir dam to fail. Over 200 lives were lost and the USACE estimated the damage to be near $120 million.\(^8\)

Several things came together after the 1972 flood to ensure that the damages incurred at the time would not be repeated. Almost immediately following, the city approved a floodplain-management program that came to be known as the “greenway” concept and money from HUD and used some nonfederal sources to convert most of the floodplain into a large park. The city purchased the lots and the remains of the buildings within the floodway, and sold the flood-damaged structures. The buildings were either moved to new locations or demolished by salvage operators.\(^9\) Several picnic areas or low-maintenance grasslands have been established. A large natural area that has been planted with native species was put in as well as several ponds and ice-skating rinks. A bike path traverses the entire floodway from end to end.\(^1\) The floodway has been met with great success both in an engineering sense and in terms of local public acceptance. As we move further from when hazards strike however, people tend to forget past difficulties. In recent years, there has been pressure to permit increased commercialization of the floodway.\(^2\) So far, the City Planning Commission and the City Council have not succumbed to these pressures. The strong memory of the 1972 flood has deterred this proposed encroachment. However, just three years following the flood a new high school and civic center were built on the floodway fringe area, despite widespread objection to the location. City engineers emphasized that the buildings were of massive brick construction and that people would have ample warning to evacuate them in the event of a flood. These decisions on the parts of city officials, in addition to the prevalent role of social memory plays on floodplain settlement will be

\(^8\) United States Army Corps of Engineers. Various Reports.
\(^1\) *Ibid.* 838
\(^2\) *Ibid.* 841
discussed at length later in this literature review. I would argue that what makes the South Dakota case exceptional is this long standing attitude towards deterring development on the greenway. The key to this success lies in the attitudes and perspectives of the people who call Rapid City home. The greenway is a beloved part of the city so regardless of resident’s knowledge of flooding or memory of the events of 1972 they will advocate for the greenway. Having the sustained support of the community has made Rapid City the example it stands as today.

The Great Flood of 1993 (Mississippi River) was one of the next major hazard events to strike the United States. The event was one of the costliest disasters in the United States at the time, with damages coming in at about $15 billion and effecting 745 miles of the basin on the river and inland. Above average rainfall that began early in the year in Iowa and Missouri, coupled with a heavy summer rainy season led to catastrophic flooding on the upper Mississippi River and its tributaries.93 Of the cities affected, Davenport, Iowa is one that faced a particularly hazardous summer and chose to implement natural flood control measures to help mitigate effects of the disaster. Prior to the 1993 flood, a mid-1980s plan to help the federal government build a $34 million floodwall was rejected by the city. They instead chose to focus on buying out low-lying properties and building flood resilient structures. After flooding in 1993, the city chose to continue its current approach to flood resiliency instead of transitioning to committing to the high cost of permanent flood barriers. They chose instead to opt for an environmentally sound approach of embracing the natural flow of the river with parks, wetlands and flood-friendly

buildings. They also utilize a flood warning system. Flooding is designed to happen in the downtown area; during wet weather a portable bridge is floated to allow continued access to home baseball games, parks line the river front and bike paths are the norm. Davenport offers an adaptive approach to flood plain management. Rather than fighting to control the river, the residents of Davenport have learned to live with it. In the aftermath of the 1993 flood, the Midwest also saw success with the utilization of retreat as an adaptation measure. The town of Valmeyer, Illinois (located just downriver from St. Louis, about 200 miles south of Davenport), saw 16 feet of water inundate almost the entirety of the 900 person town. Valmeyer’s residents voted to relocate to the top of a nearby bluff, rather than rebuild in place. The preference for a collective relocation plan had become clear through a series of community meetings. The community would have been dispersed by individual buyouts, while rebuilding to FEMA floodplain elevation standards was undesirable for some and unaffordable for others. About two-thirds of the town’s nine hundred residents eventually moved to the new site. The relocation took twenty-two government agencies and $35 million in federal and state funding. Relocation is a tangible example of a safe development practice.

In the management approach in Davenport we see some of the extraordinary levels of individual commitment that were present in the Tulsa case. Following the 1993 flood a core group of individuals spearheaded to effort to resist the government plan to build a floodwall, stating that it would compromise the aesthetic value of the river and the way of life along it. While this approach has generally worked for Davenport over the last 25 years, with a few

especially wet years that saw flooding, it is important to take into consideration the implications of the most recent 2019 floods on the area and how it will affect the city going forward. These floods inundated the downtown area for almost 10 days after a temporary floodwall put in place breached and before flood waters began to recede. The temporary floodwall was thought to be a catch-all solution at the time but clearly did not pan out to be as successful as the city hoped it would be. It begs the question: is it time to reconsider how Davenport thinks about floodplain management or if coexistence with the Mississippi River is still a viable form of flood hazard mitigation? While the flooding is inconvenient, the usage of a greenway along the riverbanks avoided floods affecting homes or businesses since most of the land touching the river is greenspace. Is this a fair risk for the people of Davenport to pay to be able to enjoy the river when it is not at flood stage?

About 160 miles down the Mississippi River, the town of Hannibal, Missouri has taken almost a completely opposite approach. In Hannibal, 34-foot-high levees stand between the town and the river, looming ominously over the downtown area. By the time it reaches Hannibal, the Mississippi is flowing quickly and is more than half a mile wide, but the walls completely obstruct the river from view. Not only do the walls and levees visually block the river, residents insist they simply make flooding worse. Under natural circumstances, the river would have room to expand across the floodplain when it swells, whether that be from heavy rain or excessive snowmelt. Instead, the levees (structural solutions) constrict the water to a narrow passage, making the water rise higher and move faster as it flows downstream, often overtopping the walls that are meant to confine it. In an analysis of the 1993 floods author Lee Larson asserts

98 Ibid. 60
100 Ibid. 13-20.
that this effect has stoked a certain amount of animosity between individual communities along the river and provoked to so called “levee wars” that see some areas illegally increasing levee heights, causing the water to crest over a surrounding neighborhood’s smaller or shorter levee.\textsuperscript{101}

This is not the only setting where Missouri sees adjacent communities warring with one another.

Kansas City, Missouri and Kansas City, Kansas both sit on the Missouri River. In regards to management, the sister city’s governments must work across city, county, and state lines to provide successful basin-wide management to residents. In her recent environmental history of the Kansas Cities, Amahia Mallea addresses the things that bind the cities together in their pursuit of sustainable river management. While her work does not specifically touch on the river in regards to floods (it focuses heavily on sewage and drinking water management), it does highlight how the formation of the Mid-America Reginal Council (MARC) made great strides in the collaborative management of the Kansas Cities’ resources. MARC functions as a Council on Governments to encourage cooperation on issues that extend beyond the jurisdiction of a single county, city, or state; one of the outcomes was the continuous concrete wall that contains the river through both cities.\textsuperscript{102} Collaborative organizations that have a degree of government oversight can be the key to better basin-wide management. It is clear that the state of management in the Midwest has both successful aspects and flaws; it is important for officials in Louisiana to be able to absorb and learn from these instances.

The last case study is that of Ellicott City, Maryland. The issues facing this settlement are no surprise – the city lies in the lower reaches of an enclosed valley, causing the flood waters to

\textsuperscript{101} Ibid. 17
\textsuperscript{102} Amahia Mallea. A River in the City of Fountains: An Environmental History of Kansas City and the Missouri River. Lawrence, KS: University Press of Kansas, 2018.
pool and then fill the downtown area, not unlike a swimming pool.103 Ellicott City experienced a series of devastating floods very recently, in 2016 and 2018, which has yet to attract academic literature on the topic of its floodplain management practices. However, the experiences of this town are very similar to the community of Central, which this thesis will focus on; therefore local newspaper accounts and governmental pieces provide documentation of this scenario.

Records show Ellicott City experienced flooding as far back as 1817. The town is prone to flooding based on its location downhill from the Patapsco and Tiber rivers. In 2016, the region saw 7 inches of rain in 2 hours causing catastrophic flash flooding and $22 million in damages in addition to $42 million in lost economic activity for the tourist town. A number of expensive mitigation strategies were discussed after the 2016 flood, most of which involved constructing more stormwater ponds, building stream walls, widening the culverts beneath the streets, and building parking garages engineered to catch stormwater. The city attempted to pass a moratorium on new development, but did not pass.104 Accepting the characterization that the storm was a 1 in 1,000 year event and was unlikely to occur again, the town rebuilt with the overwhelming support of the tight knit community. But two short years later Ellicott City faced an eerily similar situation, exposing how fundamentally vulnerable the community truly was. Following the floods of 2018, the town was slower to rebuild. They were swept into a local political scuffle with leadership shifting in the middle of planning and dueling over ideas for how to treat future floodplain management. One popular plan amongst officials included putting in a greenway, similar to the systems in Rapid City, Tulsa, and Davenport. This approach faced intense pushback from the community which insisted that the character of the town was tied to

the historic buildings – tearing them down would be sacrilegious.\textsuperscript{105} This kind of resistance is important to note, as it shows again, how the actions and voices of a few people can truly affect the outcome of polices and ordinances that come to fruition. The people of Ellicott City are its fabric, much like communities anywhere in the United States. But their commitment to the historical integrity of the town, their reluctance to relocate is a spirit that is alive and well in Louisiana and in Central. This begs the question, when does retreating rather than rebuilding become the rational choice?

\textit{Conclusions}

Flood hazard issues are incredibly diverse. To fully understand the best course of action to deal with them, it is critical to have an understanding of the background of how the United States came to have its current stances on flood recovery. From the early theories of Gilbert White to the passage of the National Flood Insurance Act to the development of academic literature to the roles that communities and individual people play, the United States has seen intense growth of resources to deal with flood hazards. This literature review aimed to provide a comprehensive background of three main categories: (1) the evolution of flood policy in the United States, (2) a review of academic literature on social memory, resilience and the importance of community led action, and (3) case studies of specific example as to how the United States has applied flood hazard mitigation schemes in the recent past. I will now look to apply these principles to the specific case of Central, Louisiana.

\textsuperscript{105} Linda Poon. In a Town Shaped by Water. The River is Winning. \textit{City Lab}. 19 May 2019. 
https://www.citylab.com/environment/2019/05/ellicott-city-flood-control-historic-downtown-memorial-day/589054/
3.1. The City of Central

What is now the city of Central was long a collection of unincorporated suburbs of East Baton Rouge Parish consisting of roughly 18,000 people.\(^{106}\) Even prior to the unincorporated suburban development, the region was inhabited by Amite and Choctaw Native Americans.\(^{107}\) Upon the arrival of European settlers, the main early economy consisted of cotton, sweet potatoes and pine mills. Additionally the Greenwell Springs Resorts’ construction in the mid 1800’s brought an influx of people to the area, with the natural springs rumored to sure any disease of ailment.\(^{108}\) Down the line, Standard Oil come to town in 1909, shifting the economy from agricultural to a more industrial focused economy. In 2005 residents voted to incorporate their own city. The impetus for creating a separate jurisdiction was residents’ desire to create an independent school system. To accomplish this goal, the state legislature required incorporation. After incorporation, state voters passed a constitutional amendment authorizing the creation of the Central Community School District in November 2006. The amendment authorized Central to govern its own public school system.\(^{109}\) The appointment of a school board and superintendent in 2007 allowed the first classes to begin in the 2007-2008 school year. Since its opening, Central High School has skyrocketed to a top ranking among education institutions in the region.


\(^{108}\) Ibid.

and continues to excel academically. The city’s population has also risen from 18,000 at its inception to over 26,000 in 2019.\textsuperscript{110}

While the school system in Central flourishes now, the greater rural area around Central has a fraught history with education and race relations. It is important to note the demographic breakdown of Central; in 2000, prior to the breakaway, the town was 78 percent white.\textsuperscript{111} As of the 2010 census this percentage had risen to 83.\textsuperscript{112} Just north of Central, lies what are known as the Florida Parishes. This region was much slower to develop and remains largely rural, with a fairly violent history of blood feuds and intense hostility to organized authority.\textsuperscript{113} On the education front, Louisiana struggled in the early days of integration. New Orleans pushed court-ordered de-segregation efforts that resulted in “schools shifting from overwhelmingly white to integrated and increasingly black and poor.”\textsuperscript{114} East Baton Rouge schools went down a similar road as similarly ordered de-segregation efforts in the 1980s led to a steady decline in white students but an in increase in black students in parish schools.\textsuperscript{115} However, in addition to these facts, it is crucial to understand why families leave integrated schools. Bankston and Caldas assert that this so called “white flight” does not necessarily stem from racist attitudes. They argue that families with the means choose to send their children to the schools that offer the best education for their children, which leads them to avoid low-performing schools that may have

\begin{itemize}
\item \textsuperscript{113} Sam Hyde. \textit{A Fierce and Fractious Frontier: The Curious Development of Louisiana’s Florida Parishes}, 1699-2000 (Baton Rouge: Louisiana State University Press, September 2004)
\item \textsuperscript{115} Ibid. 39
\end{itemize}
more limited resources available. This could mean moving from cities to more middle class suburbs. Central essentially arose as such a suburb of Baton Rouge. Despite being a relatively new development, much of the recovery of Central following the flood can be attributed to an immense sense of unity among the residents who moved. The preexisting condemnation of a large government combined with the history of de-segregation in East Baton Rouge Parish undoubtedly played a large role in creating that sense of unity. It created an insularity that no one other those residents understood and was most certainly underscored by the creation of the new school district as well. The shared goal to escape Baton Rouge and its associated social strife contributed to unity and attachment to place and has subsequently affected the flood recovery process.

Central operates its own police and fire departments, but the parish continues to provide several other services, such as water, sewerage, and trash.116 The municipal government only has three direct employees: the mayor, an assistant, and an administrative officer. Private companies contract to provide the remainder of city services. The municipal government's only source of revenue, since 2015, has been a 2 percent sales tax.117 In addition to making it difficult to mobilize resources on short notice (such as when a hazard event occurs), decentralization of local government lends itself to a less transparent form of governing and weaker relations with residents. It can also mean less direct staff on hand. Flood mitigation and drainage authority are shared between the floodplain administrator and the office of Public Works. Prior to the

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appointment of an official floodplain administrator, all these duties were carried out by the office of Public Works, and the departments still work closely in tandem.118

3.2. Flood Risks

For most of the region’s settlement history since the 1700s, development avoided the riskiest areas and previous floods were relatively inconsequential. During the early 1960s, few people in Central had direct memories of the miseries of inundation. These kinds of memories can directly impact public policy planning for flood hazards. Strong memories prompt avoidance of floodplain development altogether; while weak memories allow the erection of structures in the floodplain that allow an aggressive development scheme. As a response to an uptick in flooding problems in Baton Rouge in the 1950s, the state and parish initiated channelization of certain waterways north of the settlement areas in 1957 and shifted a majority of the problem to the less densely populated areas of the parish, which at the time, included areas such as Central.119 Prior to the 1983 flood, federal and local government had suggested a number of structural works as the best alternatives to reduce flood losses. By 1965, public officials recognized that flood damages were a growing problem, but some among them held the belief that flood risks were devaluing existing properties and impeding development.120 Such attitudes acknowledge past floods, but take the position that flood control can eliminate or dramatically reduce risk. More importantly it helps to justify ideas that suggest that an economy must turn to development to grow economically. In the early 1980s the Louisiana Department of Transportation and Development (DOTD) undertook several studies to analyze the potential costs and benefits of popular structural ideas (the Comite Diversion Canal and the Darlington

118 Kathi Cowen, interview by author, Central, June 13, 2019
119 Flood Risk Mitigation of the Comite River. USACE Report. 1974
120 Ibid.
Reservoir, both discussed at length later), though neither has seen great progress since. At the time, Rod Emmer, the director of the Louisiana Floodplain Manager’s Association, saw the need for more comprehensive management and called for a basin-wide flood reduction plan. This proposal eventually resulted in the formation of the Amite Basin Drainage and Water Conservation District, created to foster research about the proposed solutions and coordinate basin wide management efforts.\textsuperscript{121} Emmer found that the 1983 flood along the Amite River was the fourth in a decade, and that losses could have been reduced with proactive flood-reduction projects.\textsuperscript{122} He also asserted that planners had repeatedly called for such action, and concluded that the problem was not a failure to plan, but a failure to follow through and complete projects.

After the 1983 flood, additional dramatic floods occurred in 1990 and 1993. In 2001, Baton Rouge saw 19 inches of rain over the course of two days as Tropical Storm Allison unleashed extensive inundations.\textsuperscript{123} Even in the lead up to the August 2016 floods, in March that same year, 9-15 inches of rain fell and inundated much of the same area that was devastated later that year.\textsuperscript{124}

Following the 1983 flood, local officials began taking steps to improve flood protection systems and reduce risk. This included raising and modifying highway bridges that impeded the flow of river water, and upgrading levees and pumps to manage excess backwater flooding in the lower reaches of the river basins.\textsuperscript{125} Following these floods, Baton Rouge and Denham Springs

\textsuperscript{122} Ibid. 136
made some efforts to amend their floodplain building standards to reduce risk and public officials secured authorization in 1986 for the Corps of Engineers to build a diversion canal to redirect excess water from the upper Comite River basin to the Mississippi. Voters even approved a tax to fund a portion of the project in 2000. A notable change took place in 1993, when East Baton Rouge Parish required new construction to be built two feet above the base flood elevation. This revised ordinance provided significantly higher levels of protection for new homes, but it did not apply to existing structures, nor did it address the larger issue of basin-wide runoff produced by multiple subdivisions. Consequently, sprawl continued, runoff increased, and the number of homes at risk proliferated. While on the surface this is a clear picture of economic development trouncing safe development opportunities, it is also important to note some of the more subtle implications of these actions. In some cases, it is inevitable that the line between safe and economic development can become blurred. Policymakers may set out with an intent to pass a policy that promotes safer development but inadvertently bring about consequences that trend more to economic development. For example, in trying to make hazardous areas safer, the federal government in fact substantially increased the potential for catastrophic property damages and economic loss. Although it appeared that the new base flood elevation rules supported risk reduction; however, it proved difficult to sustain these actions in the long run as more people moved into the community. An increasing population put pressure on the community of Central to permit new construction and the lead up to the 2016 flood saw several subdivisions developed in areas that were close to the river, where flooding was

126 Ibid.
inevitable. A majority of Central land area lies in the 100-year floodplain and close to 90 percent of houses there sustained some damage in 2016, with many of the houses used slab-on-grade construction.

Development that encroached into flood prone areas for economic gain was not an issue unique to the greater Baton Rouge area; it was also a prominent problem down the Mississippi River in New Orleans. Burby asserts that the extensive damage in New Orleans due to Hurricane Katrina and the trend in increasing numbers and severity of disasters are the completely predictable outcomes of well-intentioned, but short-sighted, public policy decisions at all levels of government. This was clearly demonstrated in the decision to build the levee system that encircles much of New Orleans. Similar to the timeline in Baton Rouge, Orleans and Jefferson parishes endured nineteen damaging flood events and eighteen hurricane events – almost one per year – over the twenty-three year period between 1978 and 2000. Given this extreme level of risk and exposure Congress authorized federal assistance for levees that would make it possible to convert 9,600 acres from wetland to productive development use following devastating hurricane losses in 1947. These levees would help prevent a recurrence of the losses experienced from the 1947 hurricane, and, more importantly, they would allow for continued urbanization of this very hazardous region. Alarmingly, protection of existing development accounted for only 21 percent of the benefits needed to justify the project, while 79 percent were

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to come from new development that would now be feasible with the added protection provided by the improved levee system.\textsuperscript{133}

As a result, development into the floodplain was rapid, and compounded by the extraordinary damage that ironically devastated the region within the levee system during Hurricane Katrina in 2005. Federal policy has had a heavy-handed effect on facilitating and sustaining development in hazardous areas. A paradox exists that by trying to make the most hazardous parts of New Orleans safe for urban expansion, local leaders and entrepreneurs had the unintended effect of directly contributing to the devastation brought by Hurricane Katrina, since it increased the amount of development possible in low-lying, flood-prone areas. Some residents and researchers even suggest that by providing levee protection and new drainage works to that area of suburban growth, the Army Corps and city diverted resources that could have been used to improve drainage, pumping capacity, and levees in older areas of the city.\textsuperscript{134} Similar paradoxes existed in development practices in the incorporation of the city of Central, since much of the town’s developed area previously had remained undeveloped, open space.

According to the National Oceanic and Atmospheric Administration, flood losses increased fourfold in the United States between 2012 and 2013. Monetary losses totaled $2.15 billion.\textsuperscript{135} Due to changes in climate, increases in the occurrence and intensity of heavy rainfall events will likely exacerbate the negative effects of flooding among most inland regions of the United States.\textsuperscript{136} More frequent storms and their related hazards pose an even greater threat to many coastal communities. In addition, hurricanes and tropical storms have been moving slower,

\textsuperscript{133} \textit{Ibid}. 179
\textsuperscript{134} \textit{Ibid}. 182
often stalling over inland areas and dumping huge amounts of rain on locales that are not
equipped to deal with such a violent deluge. This has occurred several times in recent years,
notably in Houston during Hurricanes Harvey (2017) and Imelda (2019), and the unnamed rain
system responsible for the 2016 floods in Louisiana.\textsuperscript{137} Many communities along U.S. coastlines
have begun to take heed and have slowed development in coastal flood zones, but inland
communities are also at risk – and in some, development in flood zones is increasing.\textsuperscript{138} Qiang et
al. found that while new urban development in flood zones near coasts has generally declined,
but that it has grown in inland counties.\textsuperscript{139} This is worrisome, in that it implies that people who
have experienced flooding on the coast migrate inland, but may not realize that they are still
vulnerable if they relocate to an inland flood zone. Some of the worst damage from hurricanes
along the East Coast in the past several decades has come from inland flooding along rivers after
storms move ashore. Severe weather evacuation often directs residents to seek shelter inland, but
river flooding can put them at risk if there are not enough shelters and accommodations in safe
locations. Additionally, inland communities may not take adequate measures to ensure the safety
of their residents. Coastal communities are better versed in adaptation and mitigation techniques
related to tropical weather. Hurricane Floyd in 1999 showed that tropical weather events could
wreak havoc inland, mainly through river flooding. Floyd moved onshore near Cape Fear, North
Carolina in mid-September with wind speeds of about 105 miles per hour and traveled
northward, dumping up to 20 inches of rain along a path stretching into New England and
Canada. The amount of rainfall overwhelmed most of the rivers in the eastern part of North
Carolina. Floyd’s impact was particularly devastating because it quickly followed Hurricane

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\textsuperscript{138} Yi Qiang, Nina SN Lam, Heng Cai, and Lei Zou. “Changes in Exposure to Flood Hazards in the United
States.” \textit{Annals of the American Association of Geographers} 107, no. 6 (2017): 1332-1350.
\textsuperscript{139} Ibid. 1338
Dennis and inundated already heavily saturated soil.140 While the effects of Hurricane Floyd gave rise to the idea that inland flooding had the potential to be as problematic as issues on the coast, not much has been done since then to mitigate potential impacts, as was seen in the destruction caused recently by Hurricane Florence (2018).

Inland migration became a prominent reality for Baton Rouge following Hurricane Katrina, when there was a 20 percent population decline in New Orleans and surrounding parishes.141 This demographic change came as a result of slow recovery after the storm and from people not wanting to return to a changing coastline. A changing coastline can put major stress on both the communities that are being lost and on those that are morphing into their role as emerging coastal areas, and must be given the proper resources to be able to succeed in leading the way in a more fluid policy arena. The 2017 Coastal Master Plan identifies projects designed to maintain and build land, reduce flood risk, and provide habitats to support different ecosystems.142 The Coastal Protection and Restoration Authority (CPRA) is committed to implementing successful policy tools by working directly with state and local agencies, the Louisiana Department of Transportation and Development, the Department of Natural Resources, the Office of Community Development and the State Hazard Mitigation Plan.143 Baton Rouge and its surrounding parishes are particularly vulnerable to floods. As discussed previously, a large flood in 1983 caused some US$344 million in damages in the Amite Basin.144

142 Coastal Protection and Restoration Authority (CPRA) (2017) Louisiana’s comprehensive master plan for a sustainable coast. CPRA, Baton Rouge, LA. pg. 94
143 Ibid. pg. 128
For Central, a perceived potential for flood risk reduction comes from the Comite River Diversion Canal. Developers have intensively built up areas along the Comite and Amite rivers and in the territory where the two rivers converge and back up into Bayou Manchac during floods. Meanwhile, the Comite River Diversion Canal, which would address flooding risk by channeling water from Louisiana's Comite River away from the Amite River and into the Mississippi River, has received irregular and inadequate funding and is years from becoming operational.¹⁴⁵

![Figure 3.1. Comite River Diversion Canal Project. Source: Louisiana Department of Transportation and Development. Accessed on 25 September 2019](http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/Public_Works/Levee_Safety/Pages/ComiteRiverDiversion.aspx)

The project will consist of a 12-mile long diversion channel from the Comite River to the Mississippi River, a diversion structure at the Comite River, guide levees, the Lilly Bayou control structure, four drop structures at the intersections of the diversion channel with McHugh

Road, Bayou Baton Rouge, Cypress Bayou, and White Bayou, and Highway and Railroad Bridges. Low-flow augmentation pumps at the intercepted streams and an earthen closure at Brooks Lake, clearing and snagging of Bayou Baton Rouge, White Bayou and Cypress Bayou north of the diversion channel will reduce flooding in those areas. In addition to the direct reduction of impact of flood stage in the main impact areas, it is thought that the Comite Diversion Canal will also benefit emergency planning and response mechanisms by lowering flood levels that can inundate roads. When completed, the 12-mile canal would redirect high water from the Comite River toward the Mississippi River, passing between Baker and Zachary, to the west of Central. As of late 2018, engineers in charge of the project hoped to have that the project ready for use by the 2021 hurricane season – a highly aggressive timetable, given the current state of affairs. P.J. Varnado, the project leader from the Army Corps of Engineers has stated that the main challenge facing construction comes from the need to relocate utility lines in the area. The state and the Corps must coordinate with electric companies, railroads, and the oil and gas industry to move electric and rail lines, and pipelines out of the canal’s path. Official groundbreaking for the project’s renewal commenced in April of 2019, with several state officials present, following decades of planning.

A second highly touted and equally controversial solution to EBR parish’s flooding woes comes in the form of the proposed Darlington Reservoir project. At the same time the Comite Diversion Canal Project started to gain traction, the Corps of Engineers began studying on the

149 Garret Graves, interview by author, Baton Rouge, November 8, 2019
potential benefits of a reservoir on the East Feliciana-St. Helena Parish line proposed by the Louisiana DOT. Following the conclusion of the DOTD study in 1989, the U.S. Army Corps completed studies in 1992 and 1997; the first study found insufficient benefits, but following the latter study, the Army Corps did in fact re-evaluate and find benefits; however they were unable to secure state and local sponsorship funds. The project was contentious since it would dam the Amite River and intentionally flood sparsely populated land in East Feliciana and St. Helena parishes. While calls for the reservoir’s construction have remained dormant for some time, there was a resurgence following the 2016 floods, especially by residents calling for a re-evaluation of the cost-benefit analysis performed by the Army Corps; however in December of 2019, the St. Helena Parish Police Jury voted against this proposed revival.

Historically, flood protection has seen a number of development steps depending on the type of flood: a flash flood obviously requires different responses than a flood which regularly inundates the lower part of river basin. Flash floods have high velocities and high erosive forces, and only extremely solid structures can withstand such force. The main solution for escaping a flash flood used to be to get out of harm’s way by moving houses and other belongings to grounds which are so high that no floods can reach them. But in the floodplains of large rivers, velocities are lower and the main danger is from the wide extent of inundated areas, as has been seen across the U.S. in recent years. Prior to the passage of flood-related policies people

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151 Ibid.
responded to such floods in a variety of ways; (1) by moving the location of their cities and villages out of reach of the highest flood which they experienced, or of which they had clear indications, such as deposits on old river banks along the flood plain, (2) by self-insuring by building structures expected to endure regular damage, or (3) to elevate structures above common risk. Now, we often rely on floodplain maps to determine where to find suitable places to build and develop. Prior to the 2016 flood the people of Central largely subscribed to the notion that “we haven’t flooded before, we don’t live close to the river, so there is no way that it can happen to me.”

Localized flooding tends to be spatially repetitive over time, and local decision makers have an opportunity to learn from previous events and make proactive policy adjustments to reduce the adverse effects of a subsequent storm. Despite the importance of understanding the degree to which local jurisdictions learn from flood risks and under what circumstances, preventable flooding damage is still rampant, especially when it comes to questions of public safety versus economic development. The basic concept of safe development is that land exposed to natural hazards can be used for development if steps are taken to make it safe for human occupancy. The means of achieving this have evolved over time, but they basically include measures to mitigate the likelihood of damage and measures to deal with any potential financial risk. Such mitigation can come from the construction of physical barriers to lessen the impact of hazards or by enacting policies that encourage citizens to lower their own vulnerability to hazards. When governments do not take these precautions they are participating in strictly economic development, which can lower a community’s resilience. An issue that exists in this

155 Wayne Messina, interview by author, Central, July 22, 2019.; Kathi Cowen, interview by author, Central, June 13, 2019
situation is that while local citizens bear the brunt of human suffering and financial loss in disasters, local officials pay insufficient attention to policies to limit exposure.\textsuperscript{157} It is not uncommon for cities that are experiencing rapid development and expanding suburbs, such as the development of Baton Rouge into the Central area, to prioritize development over issues of safety (in this case, in the form of environmental hazards). In a conversation with Congressman Garret Graves following the flood, he stated that development occurred fast in Baton Rouge, while resilience and floodplain management had not.\textsuperscript{158}

One of the main ways to involve communities in safe development practices is earn local property owners discounts on flood insurance through the NFIP’s Community Rating System. The FEMA Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements.\textsuperscript{159} Residents can attain lower flood insurance premium rates by achieving certain goals that exceed the base level NIFP requirements. Many communities, especially those with severe flood hazards, high rates of growth, or a history of repeated flooding, are aware of the wide range of actions they can take to reduce flood risk in addition to participating in the NFIP. These actions keep their citizens safer, minimize property damage, build resiliency, and foster a better quality of life within the community. Participating in the CRS enables communities to earn insurance premium reductions for their residents for activities already being implemented by a community. Authors of a 2016 study evaluated how flood mitigation, risk, and location choice affected the CRS’s success. They analyze how different socioeconomic factors affect community member’s perception of risk and the program as a whole. Fan et al. assert that college graduates

\begin{footnotesize}
\footnote{Ibid. 183} \footnote{Representative Garrett Graves, interview by author, Baton Rouge, November 7, 2019}
\end{footnotesize}
value the CRS program at higher levels than those without a college degree. Individuals born in high-risk regions also tend to place higher value on community-level flood mitigation activities. Using the two-stage sorting model, they find that individuals value overall community safety due to flood mitigation activities and potential savings from reduced flood insurance premium, which are reflected by the CRS credit points earned by the community. Generally, individuals place the greatest value on activities related to the public information about flood risks. In a similar but more dated study, Viscusi and Zeckhauser suggest that people who perceive themselves at greater risk tend to be more supportive of public assistance and that policy preferences reflect self-interest.\textsuperscript{160} It is unsurprising that people are more apt to take action when an act has a higher chance of affecting them adversely and directly. East Baton Rouge Parish has the second most CRS points when compared to other Louisiana parishes at 2,063 and receives a $2,984,739 CRS total discount.\textsuperscript{161} Interestingly, Louisiana as whole receives more credits on average than the rest of the country for drainage maintenance costs, but ranks far below the rest of the country for levee safety.

Forty-two percent of East Baton Rouge Parish, 70 percent of Ascension Parish, and 75 percent of Livingston Parish are in 100-year floodplains.\textsuperscript{162} Seventy percent of Central lies in the floodplain. As a result, the city has made an effort throughout its existence to help residents mitigate preventable risks. The City of Central is a participant in the National Flood Insurance Program and the Community Rating System. Following incorporation, the FEMA amended flood maps for the city in 2008. The special flood hazard area added many neighborhoods within the new town boundaries that were not previously in the flood zone, driving up the cost of insurance.

a great deal for longtime residents of the area who did not support the change. A long-fought battle ensued, concluding in July 2016. A Letter of Map Revision (LOMR) and the LSU AgCenter flood map reassigned many homeowners in the Central community to flood zone “X,” which indicated that they were in a no-flood zone. In some cases, residents also dropped from flood zone “A” to flood zone “AE,” which lowered their yearly flood insurance premiums. This was celebrated at its inception, but just a few short weeks later the area was hit with catastrophic levels of rain which led to disastrous flooding. Many of the people who suffered some of the worst flood damage were people that had recently dropped their flood insurance.

To assist homeowners that live in flood-prone areas, FEMA puts out Flood Insurance Rate Maps (FIRMs), which delimit areas of high, moderate and low flood risk, broken down into different zones. While the intended purpose of FIRMs is to show special flood hazard areas (SFHAs) and provide basic information for town planning and insurance purposes, the methods of determining these zones can leave something to be desired. For instance, accurate flood inundation mapping must contend with uncertainties when determining the SFHA’s and a relatively short record of information. Additionally, they are not always accurate in portraying information that is useful for non-insurance flood hazard mitigation purposes. FIRMs need to be accessible to local users and do a better job of mapping actual risks. In the United States, and especially in Louisiana, exposure is acute in that a combination of subsidized flood insurance and homeowner tax incentives has encouraged development into risky areas in floodplains and

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164 Ibid.
165 LSU AgCenter. Base Flood Map Interactive Portal
166 Victoria Greene, interview by author, Central, October 1, 2019 // Representative Garrett Graves, interview by author, Baton Rouge, November 7, 2019
coastal zones.\textsuperscript{168} This necessitates that FIRM’s be readily available to the public and be able to accurately portray flood risk. While FIRMS do exist online, not all those who live in flood zones are well informed on how to interpret them or even know to consult them.\textsuperscript{169} While FIRM’s are meant to reflect historical precipitation in order to project future risk, in recent years uncertainties have played a bigger role. Critical to the events of 2016 were stream flow backup and abnormal rainfall levels, things that would not show up in a traditional FIRM.\textsuperscript{170} As mentioned previously, many houses that flooded were not in designated flood zones, meaning the owners were exempt from flood insurance requirements. Furthermore, because of the high premiums, many residents who lived in those areas did not elect to purchase what they viewed as an unnecessary expensive. However, in the aftermath of the 2016 flood events, local residents’ opinion about the need for map revisions appears to be mixed. My review of current FIRMs for Central indicates few amendments. FEMA claims that the flood-producing rain was so unprecedented that it did not mandate a re-examination.\textsuperscript{171}

3.3. The Flood of 2016

In the early hours of August 11\textsuperscript{th} a rain system flared up in southern Louisiana. It remained mostly stationary, resulting in torrential downpours in Baton Rouge, Lafayette, and surrounding areas. The National Weather Service reported rainfall rates of up to 3 inches an hour with totals surpassing 2 feet in some of the worst affected areas. Peak accumulation was almost 32 inches in Watson, Louisiana, immediately to the northeast of Central. In Central itself, peak


\textsuperscript{169} Dennis and Patsy Keenan, interview by author, Central, October 7, 2019.


rainfall reached just less than 2 feet at 23.4 inches. Rain and inclement weather are not uncommon for south Louisiana in the summer, especially August which usually marks the peak of hurricane season; the lack of association with a named tropical weather system gave the public less time to implement emergency preparation since many believed there was no reason to worry.

A rapid attribution study published in early 2017 suggested that the intensity of the storm may be related to anthropogenic climate change. Due to the prompt publication of the study after the storm, the authors state they purposefully focused their assessment on one aspect of the flooding problem: the risk of extreme precipitation events that have the potential to produce inland flooding. Analyses point towards the tendency for more and perhaps stronger upper-level troughs propagating out of the western U.S. in the summer; these have an increasing potential to cross paths with low-pressure systems that form around the Gulf Coast. Combined with the projected increase in atmospheric moisture, they projected that precipitation magnitudes would increase. Large-ensemble modeling indicates that Louisiana will face the prospect of future tropical-midlatitude interactions in the future.

Historic freshwater flooding in the region encompassing Baton Rouge followed the extreme precipitation event. Provisional reports based on the USGS stream gauges from 18 August 2016 reported that thirty sites in the region registered above flood stage levels (levels at which overflow of natural banks starts to cause damage in the local area), and that floodwaters

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174 Ibid. 902
overtopped 50 of the 261 recording sites in Louisiana.\textsuperscript{175} This complex event prompted rivers to respond to local precipitation as well as upstream and downstream conditions. The backwater flooding (upstream flooding caused by high stages downstream that impeded movement from the tributaries into the main channel\textsuperscript{176}) of the Amite and Comite rivers played a huge role in the flood damages, especially in Central, which lies between the two rivers. The flood event caused not just the Amite and Comite Rivers to rise, but also triggered the rapid rise of many of the other streams, creeks, canals and culverts that drain the area as well. The Amite River crested at nearly 5 ft. (1.5 m) above the previous record in Denham Springs and the southeastern part of Central. In nearby Ascension Parish floodwaters overtopped a levee along the Amite River and damaged nearly one-third of all structures.\textsuperscript{177} Particularly notable smaller tributaries that incurred much flooding include Blackwater Bayou\textsuperscript{178} and the culverts along Hooper Road.\textsuperscript{179} With the main river channels in Central backed up with rainfall and these other tributaries swollen as well, water had nowhere to go but into the surrounding neighborhoods (the very neighborhoods that generally rely on those smaller tributaries for adequate drainage).

3.4. Recovery and Community Perceptions

This section analyzes interview responses that I collected. Interview respondents ranged in age from early 30s to 75. Respondents had almost universally lived in Central for at least the last 15 years with several buying homes in the 1970s. Several respondents were residents of the

\textsuperscript{175} J. Burton and Demas, A. “Six stream gages Set peaks of record and 50 stations were overtopped by floodwaters.” USGS, https://www.usgs.gov/news/usgs-records-historic-flooding-south-louisiana, last access: 22 August 2016


\textsuperscript{177} Ibid.


area during the 1983 flood and none of them flooded during the earlier event. Of ten people interviewed, no respondents had experienced flooding in their homes prior to 2016, even if they resided in the floodplain. Of those interviewed six had homes that are/were in the floodplain, and all of them flooded. In addition to those not in the floodplain, two respondents did not live in an area of special flood hazard and still experienced at least 3 feet of water in their homes. Of those interviewed, two did not flood, but had close ties to immediate family members (siblings or parents) that flooded and resided with them during the recovery process. Of those surveyed all owned homes in Central. Occupations were widespread with a mix of public servants, teachers, and general residents of Central interviewed. Level of education varied from high school to post graduate.

Before moving forward to interview analysis, it is necessary to have an understanding as to how Restore Louisiana, a task force set up through the Department of Housing and Urban Development (HUD) to help ease recovery efforts fits in to the flood recovery process. HUD’s Community Development Block Grant Disaster Recovery Program provides funding for the Restore Louisiana Homeowner Assistance Program (RLHP), which was appropriated by Congress in Section 145 of the Continuing Appropriations Act, 2017, Section 192 of the Further Continuing and Security Assistance Appropriations Act, 2017, and the Consolidated Appropriations Act, 2017.\footnote{Louisiana Office of Community Development. \textit{The Restore Louisiana Homeowners Assistance Program Manual}. United States Department of Housing and Urban Development. Updated August 30, 2019. Pg. 18} The grants are therefore authorized under Title I of the Housing and Community Development Act of 1974 (HCDA) for necessary expenses related to disaster relief, long-term recovery, restoration of infrastructure and housing, and economic revitalization in the most impacted and distressed areas resulting from a major disaster.
The first step in the program’s procedures is the initial survey. Homeowners may register for an account and take the survey online. Homeowners without internet access may register and take the survey over the phone, a critical point because many of those interviewed were over the age of 70 and several had aversions to the internet, preferring to deal with federal agencies over the phone or in person. After the survey, RLHP conducts an environmental review on each property. Survey respondents who own a single-family home or manufactured housing unit (MHU) that is located outside of the floodway and has no other environmental condition preventing the program from expending funds to repair or reconstruct the home, or replace the MHU, are then queued up for the application process. Survey respondents become “applicants” once they are invited to apply for program assistance. Based on the phase of the program for which an applicant would potentially qualify, Restore issued application invitations following the 2016 flood events. As of December 30, 2017, all survey respondents who had a completed environmental review that did not prevent the expenditure of program funds, had been invited to apply. As individuals continued to submit survey responses, the program proceeded to conduct environmental reviews and invite additional applications based on the results of the environmental review. The Program initially set a survey response deadline of July 20, 2018, and an application deadline of October 1, 2018. On September 24, 2018, the survey was re-opened, and the application deadline was extended in response to the announcement of a potential change to the Small Business Administration (SBA) duplication of benefits policy.

On August 12th when the rain started to fall, Dennis Keen did not know that the storm was any different than a typical rainfall event. By the second day of nearly continuous rain, he

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182 Ibid. 25
183 Ibid. 32
and his wife Patsy made the decision to evacuate as the water had risen higher than either of them had seen it since purchasing their home in Central (then Baton Rouge) in 1978.\textsuperscript{184} Down the road near Central High School, Victoria Greene left town for the weekend, feeling uneasy about the rain but it never crossed her mind that her or her parents’ house (directly across the street) would flood. Her parents would get 6 feet of water, while her house would be spared. Further to the east on the banks of the Amite River, Laci Lemoine and her husband battled with evacuating with their 3-month old daughter and two cats. They eventually made the decision to evacuate and ended up trapped on the Holden overpass on I-10 for 9 hours before being evacuated by military vehicles. And in the Central municipal offices, freshly appointed Floodplain Administrator Kathi Cowen had no idea at the time that she would spend the foreseeable future trying to piece this tight-knit community back together.

These are just some of the sentiments expressed about individual experiences during the flood. Upon evaluating conversations, several key themes emerged. Most common was the intense distrust and unhappiness with FEMA both in its inability to assist during the rain event and in the difficulty with flood insurance from the NFIP in the aftermath. In addition to discontent with FEMA, there was also a fair bit of animosity towards Restore Louisiana. People’s relationship to Restore Louisiana’s involvement in the recovery process was of great interest to me. Three of the people I spoke with, married couple Dennis and Patsy and Central resident Vickie, have had the most trouble dealing with Restore and as of September 2019 had still not received their full payments. Both parties had flood insurance and neither had flooded previously. Prior flood claims or receipt of Restore Louisiana money previously, made residents ineligible for money following the 2016 floods. Since most people in Central had not flooded in

\textsuperscript{184} Dennis and Patsy Keenan, interview by author, Central, October 7, 2019.
the past, many people in town were automatically eligible. While many people struggled with
Restore, I believe these three interviewees faced particular difficulty because of their inability to
deal with many of the necessary steps online. Laci Lemoine, a 32 year old teacher who also
received federal assistance money raised this point during her interview; that people who
struggled the most were the ones who were unable to deftly handle the federal bureaucracy.

Mrs. Lemoine and her husband were an interesting case in that they owned two homes at
the time of the flood. The young family had just had a baby and was preparing to move into a
bigger home. The couple had just closed on their new home prior to the flooding event and was
in the process of getting their old home ready for market when disaster struck. Of the events that
transpired just prior to the flood Mrs. Lemoine states, “We were eager to buy a bigger home and
one finally came up in a super coveted neighborhood that we had been eyeing forever and we
really felt we had to jump on it immediately, even though we hadn’t sold our current home. We
talked to the bank and we somehow got cleared to pay two mortgages, and they let us buy the
house and it was this big risk we felt we had to take. And then literally the day after we signed
the papers on the new house, both houses flooded.”

Despite their gross misfortune, Mrs. Lemoine and her family were able not only to move
into their new house, but also get the old house back on the market in four months. She
remembers the permit process being arduous and complicated, asserting that it was her comfort
level and persistence in dealing with government bureaucracy which allowed her to navigate the
system successfully. She remembers that several of the forms, steps, and inquiries that other
flood victims were spending hours waiting to talk to people about were available on their
website, eliminating much of the wait time and allowing their recovery process to progress

185 Laci Lemoine, interview by author, Central, October 24, 2019.
faster. This was also the case for Vitoria Greene, another young Central High School teacher interviewed. While Mrs. Greene’s home did not flood, her parents, who lived directly across the street took on almost 6 feet of water.\footnote{Victoria Greene, interview by author, Central, October 1, 2019.} Mrs. Greene and her sister assisted not only their parents but also many of their older (65 years and older) neighbors in navigating the FEMA website, allowing their community to rebuild much faster than several of the homes in the immediate surrounding area.

Age and comfort level with technology played a large part in people’s negative perceptions of federal aid, but every person I interviewed had generally positive views of the attempts made by local policy makers to assist residents, especially \textit{during} the flood. Opinions were skewed on the aftermath, but relative discontent was made obvious during the election later that year when the entire city council and mayor were voted out of office.\footnote{Terry Jones. “Central Voters Clean House.” \textit{The Advocate}, November 8, 2017. Accessed at: \url{https://www.theadvocate.com/baton_rouge/news/communities/article_98bafd94-e2c3-11e8-8778-4f23183058a5.html}} Wayne Messina, one of the ousted city council members, claims that it was an underappreciation of the scale of positive work being done behind the scenes that led to the vote. He asserts that then-Mayor Junior Davis was a phenomenal advocate in Washington, D.C. for getting federal relief money sent to the parish and city. He and many others had high praise for Congressman Garret Graves as well. According to Mr. Messina, Davis and Representative Graves were able to drum up support for federal programs in Washington that would not have been utilized had they not been staunch advocates. Of course, happenings in D.C. were far removed from the immediate destruction that was unfolding in Central itself.

Kathi Cowen, floodplain administrator, had been in her position just a few months when the floods occurred. Not only did she and her staff battle lines of hundreds of people every day in

the immediate aftermath, but the municipal building flooded as well, destroying all the computers, which had been on the floor of the building, un-elevated. City workers were forced to set up temporary headquarters outside the building every day to issue permits and assist with flood losses. In addition, since this was the first time the city had ever had someone in the Floodplain Manager role, and there were not procedures in place to follow; staff was largely coming up with a method as they went along.\textsuperscript{188} Despite this, Cowen maintains that people were more than understanding, despite some having lost everything. She states, “These people, they had lost so much, but I think because we had faces, we were members of their community, and we had also lost the same things, they were willing to give us the benefit of the doubt. Unlike with FEMA, where it was this faceless entity which was supposed to be helping us but wasn’t [not right in the aftermath at least].”\textsuperscript{189} I believe this comes from the assumption that since FEMA’s main purpose is to deal with emergency management and disaster relief, people felt they should have been better prepared to deal with it. On the other hand, residents were witnessing local policymakers and officials go through great lengths to assist them, so were more partial to the help being provided there.

To touch more on local response, it is clear that while community members were able to come together to help one another, several administrative things have room for improvement. Louisiana State Police Officer Sergeant Michelle King recounts her experience as an off duty officer at the time of the floods. “I got calls from my niece and my son early in the morning on the second day of rain. My niece was nursing her newborn and was panicking because all the breastmilk she had frozen was going bad because of the power outage. Her husband was out of town, and she waited for a long time for help to arrive because the water had risen to waist deep

\textsuperscript{188} Kathi Cowen, interview by author, Central, June 13, 2019.
\textsuperscript{189} Ibid.
in the span of an hour. My son Drew (husband to Laci Lemoine, quoted earlier) and his family were stuck on the overpass and my only thoughts were to get to my family. I live in Walker, so it wasn’t as bad there but as I got in my unit and started driving I realized I had to jump in, to help as many people as I could. I barely remember the next 12 hours; they were a daze.” Sergeant King stopped and helped private boat owners evacuate people for several hours before she finally flagged down a military vehicle that was looking for an assignment; she was the one that sent the vehicle to the Holden overpass to rescue her son and daughter-in-law.

Off-duty public service personnel performed a majority of rescues in the first 12 hours of the flood event. Sergeant King relayed in her interview that the operations centers of both East Baton Rouge and Livingston parishes were on the ground floor of their respective buildings, causing them to take on water and lose power almost immediately, effectively cutting off civilians from being able to call for help. Since 2016, both centers have been moved to upper floors in their respective buildings. Sergeant King asserts that the way mostly off-duty police officers were able to come together speaks volumes to the community of Central and mindsets in southern Louisiana as a whole. Sergeant King was also on the ground in New Orleans in 2005 as an emergency responder during Hurricane Katrina and remarked that, despite the gaps that came to light in the recovery process, emergency response as a whole was much better than in New Orleans.

A final common theme that existed among those interviewed was an intense attachment to place. Of all those interviewed, only one party indicated that they would even consider leaving the area if another similar storm were to come through. From those who had lost multiple homes

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190 Sgt. Michelle King, interview by author, Baton Rouge, October 29, 2019
191 Ibid.
in 2016, to those who had experienced flooding before, to those who had never before flooded, a clear attachment to Central was clear. Victoria Greene commented, “There are many reasons that I could leave Central [and Louisiana]. Even though I’ve been lucky to have gone to college and travel around the world this has always been home. As I’ve gotten older, I’ve become much more liberal and an advocate for the environment, things that are not always compatible with the beliefs of my neighbors. My husband and I have considered countless times, picking up and moving to Seattle, but we always come to same conclusion; it would never be home in the same way that Central is.”

Casey Burnett, an employee at LSU has lived in the Central area since the 1980s, moving in just before the 1983 floods. Her daughter was just elected to the Central City Council and her other three children and their families all live in town. She has been an active member of the community in Central since she settled there. She stated, “If I’m meant to go in a flood that’s how I’ll go, in my home in the same town as my babies.”

Dennis and Patsy, who are still waiting to finish their home and on the Restore Louisiana money, were the only respondents who showed an inkling of discontent. They mused, “If our kids weren’t so attached, I would move in a heartbeat. But home is where the grandkids are and we aren’t leaving. Maybe when they get to high school.”

When asked what their tipping points would be, or what it would take to consider leaving, most reiterated the importance of family. “If all of them go I would happily follow,” stated Vickie Fellows. Mrs. Fellows has moved 4 times in the last 20 years; not necessarily for flood-related reasons but has made great effort not to live in the floodplain, quite the feat in Central, of which almost 70 percent of land area lies in a special

192 Victoria Greene, interview by author, Central, October 1, 2019.
193 Casey Burnett, interview by author, Baton Rouge, October 7, 2019.
194 Dennis and Patsy Keenan, interview by author, Central, October 7, 2019
flood hazard zone.\textsuperscript{195} Others, like Wayne Messina remain staunchly loyal to the town, “Not me, I’ll never leave. My brother just moved to Shreveport and my kids live in Dallas. The floods can try and take me, but this is where I am meant to be.”\textsuperscript{196}

Community perceptions when it comes to flood loss are integral to the recovery process. Interviews with a collection of different people, with different backgrounds and points of view are vessels to gaining knowledge that can be transferred into sustainable action. The best way to increase a community’s resilience to natural hazards is to give them power in the decision making process.\textsuperscript{197} Central has a history that extends back past its incorporation, a whole bevy of prior actions and precedents that are in place to influence the future. It can be difficult to enact change in places that have such a commitment to tradition and history, but by incorporating the ideas and desires of the people that live there, that make Central the town it is, the city has a chance to grow and to truly prepare itself to better deal with similar problems in the future.

\textsuperscript{196} Wayne Messina, interview by author, Central, July 22, 2019.
\textsuperscript{197} Susan Cutter, Lindsey Barnes, Melissa Berry, Christopher Burton, Elijah Evans, Eric Tate, and Jennifer Webb. "A Place-Based Model For Understanding Community Resilience To Natural Disasters." Global environmental change 18, no. 4 (2008): 598-606.
CHAPTER 4. GOVERNMENT POLICY: CENTRAL AND BEYOND

This chapter focuses on the evolution of government policies in Central and how they advance either economic or safe development practices. There are several instances in the development of the city of Central when officials prioritized economic development over community safety. However, it is also important to note that there are also many instances where the line between safe and economic development is blurred, particularly in cases where safe development may lead to negative economic consequences. I will also discuss policies and ordinances from neighboring Ascension and Livingston parishes to compare and contrast the orientation of policies in different settings. Policies in the neighboring parishes overall have defined floodplains and provided a mechanism and path to implement safe development practices more consistently at the local level.

Prior to its incorporation in 2005, Central had experienced significant residential, commercial, and population growth. East Baton Rouge Parish ordinances and codes guided this development, especially actions taken following the 1983 flood, which adversely effected what is now Central (but was then a part of the city of Baton Rouge). From a thorough review of existing ordinances in Central and East Baton Rouge Parish from 1983 to the present, it is clear that policies that attempt to mitigate development into flood hazard areas existed, but they were vague – in other words, they do not clearly institute/call for safe development practices.. Parish ordinances did not always prescribe how the flood zone was meant to be developed and gaps in enforcement mechanisms made concrete change difficult. The lack of precision greatly

inhibits the ability of local government to step in and hold commercial and private developers responsible for plans to put in new businesses and residences in high risk areas.

4.1. Review of Ordinances – Early Policies in East Baton Rouge Parish

In order to evaluate safe v. economic development, I classified flood related policies based on the definition provided in Chapter 1.: (Table 4.1).

Table 4.1. Safe Development vs. Economic Development in the Floodplain: Timeline of Select Policies of the Capital Region

<table>
<thead>
<tr>
<th>Safe Development</th>
<th>Economic Development</th>
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<tbody>
<tr>
<td>Controlling the alterations of natural floodplains, streams, channels and wetlands, regulating flood barriers that would unnaturally divert flood waters in potentially hazardous ways and urged policy makers to control filling, grading, dredging and other such development activities</td>
<td>Flood Zone Determination form must be acquired for those willing to construct homes in flood prone areas of the parish. The code provides no indication of the definition of flood prone areas. EBR Ord. # 7017 art. 2, sec. 1. (1951)</td>
</tr>
<tr>
<td>Ascension Parish Ord. #9.50 sec. D, art. 1. (1998)</td>
<td>Building official would determine if there was a flood hazard present and if there was, ensuring construction to anchor structures to prevent flotation, use flood-resistant construction materials/building methods, and build proposed structures that fall in the flood zone with their lowest floor elevated to at least the base flood elevation. EBR Ord. # 13362 sec. 8, art. 3. (2001)</td>
</tr>
<tr>
<td>Delegated the responsibility of local government units to adopt regulations to minimize flood losses and set several standards for areas of shallow flooding, recognized as areas with FEMA designation AO and AH zones</td>
<td>if a flood hazard exists, the floodplain administrator must notify the permit applicant that any proposed new construction or substantial improvement should follow several criteria; using flood resistant construction materials, anchoring foundations to prevent flotation, maintaining accurate drainage, and ensuring that all new and updated structures are in line with base flood elevation requirements outlined by FEMA Central Ord. sec. 8, art. 3. (2009)</td>
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<tr>
<td>Mandated that any new construction be at least 2 feet above the BFE and additionally mandated that a certified architect or engineer submit a certificate corroborating this to the floodplain administrator</td>
<td>when a regulatory floodway has not been designated, the floodplain administrator must require that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the City of Central. Cumulative effect not defined. Central Ord. sec. 8, art. 3 (2009)</td>
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<tr>
<td>Ascension Parish Ord. #Sec 9.50 sec. A, art. 3. (2002)</td>
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<td>If downstream channel improvements are included as part of the proposed development or landfill, engineering calculations shall be made to show that the adverse effects of increased runoff from 100-year storm event due to the proposed development is offset by the beneficial effects of the proposed channel improvements. Central Ord. sec. 3, art. 7. (2016)</td>
<td>Anmite River Basin Commission prepares floodplain management plan for the whole Amite Basin but is not granted any regulatory authority ARBC Floodplain Management Plan (2015)</td>
</tr>
<tr>
<td>Buyout of Silverleaf Street in Ascension Parish to return land to wetland Ascension Parish Council Minutes (2019)</td>
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</table>
My analysis of flood-related policies in East Baton Rouge Parish begins before 1983, the last time East Baton Rouge Parish experienced catastrophic flooding, prior to 2016. Policies before 1983 are few and far between. A 1951 amendment to a development clause in the City Code requires builders to acquire a Flood Zone Determination form for houses in flood-prone areas of the parish. The code provides no indication of the definition of flood-prone areas. Policies like this that mask economic interests with vague mentions of safety, are common in the expansion of East Baton Rouge Parish, limiting the actual scope of safe development. The other important EBR Parish foundational policy in Section 8.3 specifies the requirements in the event of flood hazard. The parish council passed this act in 2001 and last amended it in 2012. The ordinance first specified that a parish building official would determine if there was a flood hazard present and if there was, ensuing construction should anchor structures to prevent flotation, use flood-resistant construction materials and building methods, and build any proposed structures within the flood zone with their lowest floor elevated to at least the base flood elevation, as per delimited by the FIRM, following safe development principles. The parish adopted FEMA’s definition of flood hazard areas, included in “The Flood Insurance Study for East Baton Rouge Parish, Baton Rouge & Vicinity.” The report states that the base flood elevation (BFE) is the minimum height at which construction can take place. The problem in this situation is that there is no requirement to build above the BFE. While it is better to build at the BFE than below it, a policy that adheres to safe development principles would require that homes be built above the

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200 East Baton Rouge Parish, Code of Ordinances Ordinance #7017 art. 2, sec. 1. (1951),  
201 Table 4.1  
202 East Baton Rouge Parish Code of Ordinances, Ord. # 13362, sec. 8, art. 3. (2001)  
203 U.S. Army Corps of Engineers Report
BFE level. Not requiring this margin of safety prioritized development and accommodated the influx of subdivisions built in Central leading up to the events of 2016.²⁰⁴

While new flood mitigation policies in EBR Parish largely dwindled after the early 2000s, neighboring Ascension and Livingston parishes were more active in passing policies that adhered to safe development principles before 2016. In response to the 1983 floods, Ascension Parish passed an ordinance in 1998 that focused explicitly on methods to reduce flood losses in densely settled areas. The policy lays out different ways to limit flood loss, focusing restricting development into the floodplain, in line with what a sustainable safe development practice should do. Most importantly it called for controlling the alterations of natural floodplains, streams, channels and wetlands, regulating flood barriers that would unnaturally divert flood waters in potentially hazardous ways, and urged policy makers to control filling, grading, dredging and other such development activities.²⁰⁵ Ironically, the failure to heed these requirements contributed to the devastating flood damage in 2016. This amendment has not been modified or effectively enforced since its passage, nullifying its safety provisions and goals. For a policy tool to be effective it must be adaptable and evolve along with changing levels of risk and land uses, otherwise it may contribute to unsustainable economic development. It also must maintain viable enforcement that imposes costs, such as a fine, on developers who violate the code. Additional steps towards positive change came in 2002 with the resolution that stated that amelioration of certain flood damage effects could be achieved through a comprehensive basin-wide floodplain management approach, prompting the Amite River Basin Commission to

prepare a flood hazard mitigation plan for the basin. The parish council resolved to support the tenets of such a plan, with the hope being that the proposed plan would be the first steps towards an effective basin-wide management scheme. While the Ascension Parish council was supportive of this plan from its inception, it took several years for the East Baton Rouge Parish council to follow suit. It also delegated the responsibility to adopt regulations to minimize flood losses and set several standards for areas of shallow flooding (FEMA’s AO and AH zones) to local units of government. The parish’s ordinances also mandated that any new construction be at least 2 feet above the BFE and additionally mandated that a certified architect or engineer submit a certificate corroborating this to the floodplain administrator. These amendments to Ascension Parish’s existing policies are a clear cut example that it is possible to implement safe development practices, even in a place where policies that promote economic development already exist. It should be noted however, that Ascension Parish’s population has grown much faster than that of East Baton Rouge Parish, allowing quick, unsafe development to occur. I would argue that the difference is that Ascension Parish is less densely populated, making the increased population less of a problem (despite also occupying a high risk area, like Central). Ascension Parish has been able to succeed where East Baton Rouge has not because of its ability to successfully implement safe development oriented policy tools.

4.2. Review of Ordinances – Policies in Central

Several policies exist in the Central Code of Ordinances that directly address potential flood issues and appear to promote safe development. One of the most prominent is in Section 8.3, which clearly states that before a builder can receive a permit, the floodplain administrator will determine whether or not the proposed building site is reasonably safe from flooding. It further asserts that if a flood hazard exists, the floodplain administrator must notify the permit applicant that any proposed new construction or substantial improvement should follow several criteria use of flood resistant construction materials, anchor foundations to prevent floatation, maintain proper drainage, and ensure that all new and updated structures align with FEMA’s base flood elevation requirements. On the surface, policies in this vein appear to be safe development, but I fear that they can in fact lead to the phenomenon that Burby discusses wherein policies that promote “safe” development often prompt an influx of people to move in, making any damage that happens down the line that much worse. For example, the parish council enacted this ordinance in 2005 and updated it in 2008, 2009 and 2012. However, during that span, Central’s population grew from 19,000 to just under 29,000 residents, bringing new commercial and residential development, including the construction of several new subdivisions in the 100-year floodplain, in high risk flood zones. Economic development clearly superseded the safe development policies as Central’s population rose. The municipal council has not made changes to this ordinance since the 2016 floods, when many of those businesses and homes flooded.

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211 Central Code of Ordinances, sec. 8, art. 3. (2005)
Section 8.3 contains several critically important policies including one that lays out actions expected of the acting floodplain administrator to stymie floodplain development.\textsuperscript{213} Actions include reviewing permit applications to determine whether proposed building site projects, including the placement of manufactured homes, will be reasonably safe from flooding, reviewing applications for proposed large developments, making necessary interpretations when a question arises pertaining to the definition of a special flood hazard zone and ensuring floodways maintain adequate carrying capacity. Perhaps most important is this clause: “When a regulatory floodway has not been designated, the floodplain administrator must require that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the City of Central.”\textsuperscript{214} However, it contains no discussion of a method for determining a metric for cumulative development. This leaves the meaning of “cumulative effect” vague, in addition to a one-foot limit being a highly lenient standard. Combined with other problems that can arise from existing development, cumulative effect may not be a good indicator of overall vulnerability to flood hazard. A proposed development by itself may cause great harm to the surrounding area; a single development may cause excessive runoff, compounding drainage problems for surrounding neighborhoods if other flood hazard mitigation measures are nonexistent. It is not ideal to leave this judgement up to interpretation. A better method may be to implement a rating system, where definitions on what factors should be considered in relation to cumulative development. Doing so would emulate safe development.

\textsuperscript{213} Central Code of Ordinances, sec. 8, art. 3. (2009)
\textsuperscript{214} Central Code of Ordinances, sec. 8, art. 3. (2009)
incentives such as the CRS method that the NFIP employs. Furthermore, interviews with city officials, made it clear that the city acted without a floodplain manager until mere months before the 2016 floods struck.\textsuperscript{215} Many of the duties that the floodplain manager would have performed were carried out by several people from the Department of Public Works.\textsuperscript{216} While this was not negligence since city workers were performing the job, it was not ideal to have several people acting in a major decision-making role with no guarantee of consistency and continuity. Floodplain managers have a responsibility to uphold safe development practices in their regions.

In addition to floodplain management issues, problems centering on residences in subdivisions are obvious. For instance, Ordinance #2012-04 addresses manufactured homes. It clearly restricts all use of landfill material for elevating sites where residents place manufactured homes. This restriction is a major issue since manufactured homes are inherently more vulnerable to issues flood due to their insecure foundations. Housing developments surrounding them may be built on filled land, causing a fishbowl effect for the areas with manufactured homes.\textsuperscript{217} Concerns about standardized fill heights have been a hot-button topic in neighboring Ascension Parish, which also suffered heavy damage in 2016. Fill regulations in Ascension were lacking in 2016, with home owners being able to bring in fill to varying levels and heights. Any homes built below the highest homes would be subject to displacement of floodwaters. Recently, the Ascension Parish Council passed an amendment that limits fill to 3 feet.\textsuperscript{218} This step carried out by the Ascension Parish Council means that builders in the parts of the parish that are most at risk from flooding may not be able to use dirt fill exclusively. Instead, they would need to use a combination of dirt and pier-and-beam or chain-wall construction to meet federally designate

\textsuperscript{215} Kathi Cowen, interview by author, Central, June 13, 2019.  
\textsuperscript{216} Central Code of Ordinances, sec. 8, art. 3. (2009)  
\textsuperscript{217} Central Code of Ordinances, Ord. #2012, sec. 8, art. 15. (2004)  
\textsuperscript{218} Ascension Parish Code of Ordinances (2019), Ord. # 9.50, Sec A, art. 1.
elevation rules in Ascension. This is an excellent example of new safe development policies being effectively put into place. The fill regulations take community well-being and development into account, enabling developers to build but also ensuring sound floodplain management. The new rules will also require the owners of neighborhood and commercial detention ponds to submit to five-year inspections and carry out necessary maintenance or face potential fines.\textsuperscript{219} It is typical for parishes across Louisiana to assign the responsibility for detention ponds to homeowners’ associations.\textsuperscript{220} When driving around Central, casual observation shows that several houses and even neighboring subdivisions exist at different levels of elevation due to fill. Certain neighborhoods are clearly much more vulnerable to flood risk than others.

Manufactured homes also caused drama in the immediate aftermath of the 2016 flood events. The Baton Rouge Code of Ordinances requires that homeowners obtain a permit in order to place manufactured homes on their front property.\textsuperscript{221} After the 2016 flood, the parish waived this requirement and allowed residents to place “FEMA trailers” on their front lawns.\textsuperscript{222} These trailers act as temporary shelter and facilitate speedy return of residents as they repair their permanent dwellings. This seems like a viable solution in theory to those affected, but getting this method right has proven difficult. Waiving the permit requirement allowed people to stay on their property in the FEMA trailers and rebuild quickly. This left people in bare bones homes which may not have been fully move-in ready.\textsuperscript{223} It also prevented people from taking the extra time to complete additional mitigation steps to prevent their homes from flooding again, such as

\textsuperscript{220} Ibid.
\textsuperscript{221} East Baton Rouge Parish Code of Ordinances, sec D, art 7. (1997)
\textsuperscript{222} Kathi Cowen, interview by author, Central, June 13, 2019.
\textsuperscript{223} Ibid.
elevating their homes. Rather, residents built back up as quickly as possible to restore their normal routines. This was the case for several of the people I interviewed, with many of them lamenting that they wish they had had the luxury of extra time to restore their homes fully before moving back in. In many cases, families sought to spend as little time as possible in a cramped trailer and desired to get their children back to a normal routine which won out over a desire for more sustainable renovations. While these policies by FEMA and the parish did not mandate rebuilding quickly, it certainly encouraged it, feeding into the government’s desire for faster economic recovery from the ordeal.

The problems associated with the FEMA trailers and the handling of disaster relief is of utmost importance to Central’s preparation for future floods. Because of its small size, Central is not able to fully separate short-term flood response duties from the task of developing a long-term plan for rebuilding a more disaster-resistant community. Due to small staffs and the necessity for staff members to wear many hats, the same people are usually involved in both immediate disaster relief and long-term planning simultaneously. Yet preparing managers and ensuring adequate training for their full range of responsibilities is a challenge. The small town of Arnold, Missouri, which faced similar development and hazard problems as it expanded out from the fringes of St. Louis offers a useful analog for successful training. It is not uncommon, especially in newly developing areas of the metropolitan fringe, for cities to be faced with problems that pre-existed zoning or floodplain management regulations, or with problems connected to development that occurred under less rigorous measures than current policies. As a result, it may be impossible to find enough money for elevation, acquisition, demolition, or flood

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224 Laci Lemoine, interview by author, Central, October 24, 2019.
225 Casey Bennett, interview by author, Central, October 7, 2019.
proofing of all structures that need attention, even within the minimum standards of current regulations. The role of planning should prioritize spending towards safety and target those properties that are most vulnerable and/or most likely to suffer additional damage in the case of a major flood.

A common action taken following flood events is for local governments to buy severely or repeat damaged property. Simply acquiring flood-damaged properties after a disaster is not enough to preclude a recurrence of the same problem. Further steps may be taken to ensure that vulnerable riverfront land is no longer available for development, in accordance with safe development practices that call for the preservation of greenspace as a potential flood hazard mitigation method. Central, and Louisiana as a whole, benefit from the existence of ample wetlands. Wetlands are commonly accepted by city officials and scientists to be a blessing for flood hazard reduction and one way to protect vulnerable communities is to restore land back to wetlands. Buyouts can aid in this process, something that the state is already pursuing along the coast through its Louisiana Coastal Master Plan. In addition, in October of 2019 Gonzalez, Louisiana was the topic of news headlines when the Parish purchased residential properties along an entire street, and Ascension Parish pledged to restore the land back to its pre-1980s wetland state. Proposed in 2017, every resident on the street had to agree to the buyout. The last

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228 Ibid.
230 Louisiana Coastal Protection and Planning Authority (CPRA). Louisiana’s Comprehensive Master Plan for a Sustainable Coast (Baton Rouge, LA: Office of the Governor, 2017)
resident consented to the plan in October 2019, and plans will now move forward to clear and convert the land. Central might consider a comparable approach to high risk areas.

Buyouts may seem like a good solution, but they also pose a host of problems. One, they most certainly fall into the category of actions that toe the line between safe and economic development, in that they seem to promote safe development but lead to potentially problematic economic consequences. The Natural Resources Defense Council (NRDC) published a report in 2019 that addresses one of the most common problems; time it takes for the buyout to reach completion. The NRDC reviewed nearly 30 years of FEMA data on buyout funding and found that it takes a median of more than 5 years between a flood and the completion of a FEMA funded buyout project. Once a property puts in a request for FEMA funding, the homeowner has no idea how long they will be in limbo. During that time, what happens if improvements need to be made to the house? If a major appliance must be replaced or even if another flood occurs? FEMA buyouts are based on pre-flood home value so will not reimburse expenses incurred in the interim between flood and purchase. If they do flood again and the home is covered by the NFIP, the federal program will pay to rebuild it yet again, simply perpetuating a cycle of flooding. The FEMA buyout process must be streamlined to be a viable option for most communities. While the Silverleaf Street scenario is promising, it is not the norm, and it may take East Baton Rouge Parish and Central quite some time to implement a similar plan.

Drainage is also a major problem in Central that is not adequately addressed in its code of ordinances. Upon interviewing inhabitants of Central, it became clear that drainage was the most

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232 Ibid.
234 Ibid. 9
important issue to the overwhelming majority of residents as well. Despite many advocates for restricting flood zone development since 1983, residents still insisted that improved drainage could fix the city’s flood problems.\footnote{Wayne Messina, John Didier, Vickie Burt, interview by author, Central, July 22, 2019, September 27, 2019, October 17, 2019.} The biggest issue when it comes to drainage in Central is the confusion over who is responsible to clean certain drainage canals. Some ditches lie in areas cleaned by the city, while others fall under parish purview, while some exist on private property under the homeowners’ responsibility. The lack of consistent drainage management lead to clogged up waterways and to the issues of backwater flooding that played a large role in the 2016 flood event. Interviews clearly revealed that most homeowners faulted the city for not cleaning ditches and drainage channels prior to the storm in 2016. Several of the interviews took place after Hurricane Barry threatened the area in July 2019. While the effects of Barry were far less damaging than initially projected to, it served as a good indicator of lessons learned and new techniques applied. I will delve further into these ideas in the next chapter, but residents expressed firm beliefs that it was solely the responsibility of the city to better protect residents from the effects of storm damage. A former city councilman commented that the city had done a better job of going out and preemptively cleaning out debris from drainage channels at the first sign of projected excessive rain, suggesting that the city ‘s response to hazard threats had improved.\footnote{Wayne Messina, interview by author, Central, July 22, 2019.}

Section 8.1 of the Central Code of Ordinances gives background on development and physical geography principles being incorporated into the long-term planning for drainage and stormwater management. It gives guidelines on what physical properties should be taken into consideration, such as the importance of an understanding of the local hydrology, topography,
and soils. The policy guidelines stipulate that it is important to identify the high points and ridges as well as the low points and swales or channels in addition to which directions the water will flow in all areas of the site. It calls for mapping floodplains, areas susceptible to flooding and minimizing development in those areas where possible. Higher areas on the site are the prime development zones. Concentrating development in higher zones and leaving the lowest areas as conservation and for stormwater management save construction costs and long term maintenance.\textsuperscript{237} Officials should test soil samples from the areas suitable for development, not just for structural purposes, but for infiltration rates and plant media quality. Much of EBR Parish has silty clay soils characterized by very low infiltration rates.\textsuperscript{238} In other words, these soils hold the water for long periods of time before they are able to reach groundwater. Some parts of the parish have more permeable soils. The types of soils and their depths can provide useful information in selecting and designing potential developments and their locations. These points are touched upon in this section, but there are no accompanying enforcement provisions. These ideas are key to safe development schemes and their very inclusion in the ordinances show that the city is capable of thinking in long-term scales, just unable to fully implement these ideas.

Impervious surfaces such as pavement and rooftops generate nine times more runoff than a woodland area of the same size. Policymakers can diminish runoff by passing local laws that require new developments to prioritize use of pervious pavement and other surfaces. While currently no example of this type of policy exists in Central, other areas in East Baton Rouge Parish such as the parking area of the relatively new White Star Market in mid-city exhibit some


\textsuperscript{238} Central Code of Ordinances (2018), Development Context, sec. 8, art. 1500.
of these practices adopted by developers without local requirements. The 26,000-square-foot development features TrueGrid permeable paving as the parking surface. TrueGrid permeable paving — when properly installed — is laid atop a bed of packed stone, leveled, and then filled with smaller crushed rock and stone to provide an attractive and permeable surface. In essence, a TrueGrid parking lot serves as an on-site stormwater detention system meaning that Square 46 will actually hold water on site, which will then slowly dissipate rather than runoff into the Baton Rouge stormwater drainage system, as happens with traditional paved parking surfaces. Change begins in small scale projects such as this; Hoffpauir Studios, the designers of this project, are based in EBR parish. Central is an incredibly community centric place; projects like this, thought up and executed locally are solutions that are entirely possible. Again, over 70 percent of the city of Central exists in the 100-year floodplain, including commercial development. It is not just homes that can be better equipped with ways to be more resilient to floods, but businesses and commercial development as well. With the support of local policy makers through incentives, similar projects are possible in the city of Central.

4.3. Comparing Policy Choices across Neighboring Parishes

There are several instances in recent political history where EBR’s neighboring parishes have enacted more impactful change that follow safe development practices than EBR, and by extension, Central itself. East Baton Rouge Parish is the most populous in the state, with just shy of 450,000 residents. Ascension and Livingston tally 120,000 and 138,000 residents respectively. It is no surprise that economic development lies at the forefront of policy

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decisions. Additionally, Ascension and Livingston have much smaller parish councils and professional staffs than East Baton Rouge. Aside from these demographic differences, several factors bring Ascension and Livingston parishes together and make EBR Parish stand out; population size, socioeconomic status of residents, and civic engagement proclivity.

East Baton Rouge is nearly double the size of Ascension and Livingston parishes combined. Similarly, they are both much less densely populated, creating a divide in the type of flood hazard issues that they face, when compared to East Baton Rouge. Topographic maps of the region show that there is more open space in the two surrounding parishes, while East Baton Rouge benefits slightly from being on higher ground.\(^\text{242}\) Population and density have huge impacts on potential flood hazards. Communities, whether at the level of countries, cities, parishes or counties, have learnt to cope with flood risks in several ways, the most prominent ways being engineering solutions and adaptive measures. From a more sustainable point of view, it can be argued that societies should avoid or at least minimize urban developments in floodplain areas.\(^\text{243}\) While many scientists have studied the impact of human activities on flood risk, policies can integrate the lessons learned from past flood impacts onto future floodplain development. This is where Ascension, Livingston, and East Baton Rouge parishes differ. East Baton Rouge Parish has grown significantly since the last round of large floods in 1983; the development into Central is a stark example of this. Reducing the properties at risk by encouraging settlement away from high-risk areas or by limiting additional human settlements in flood-prone areas is a difficult demographic problem. Many studies have shown that the urbanization of flood-prone areas continues, and puts more and more people, and property, at


risk of flooding. EBR Parish officials have not heeded this concern in the past and show little sign of heeding it in the future. While Ascension and Livingston parishes have also experienced growth, they have not experienced the same level of explosive growth as East Baton Rouge Parish in terms of dense floodplain development (though their overall populations have grown more than that of East Baton Rouge Parish). This is also a reason that it has been easier for Livingston and Ascension parishes to pass policies that can prioritize safe development over economic development. Conversely, while they do have more space to grow, (with less safe space in Ascension compared to Livingston Parish), it does not necessarily imply that they are less intent on bringing in new development. Even small demographic differences, like population size can have a huge effect on a parish’s ability to implement long term change. Additionally Denham Springs, Central’s neighbor the east, had a much more robust staff and flood recovery infrastructure in place. They had a floodplain administrator who had been appointed in 2008 in addition to a detailed catastrophic flood response plan. While Central prides itself on its small government, the more centralized form of government in Denham Springs has allowed it to develop a more effective form of floodplain management best practices.

Civic engagement is of utmost importance to building resilient communities and passing effective local laws. Community based, participatory research creates bridges among scientists, lawmakers, and communities, through the use of shared knowledge and valuable experiences.

\[^{245}\] Rod Emmer, “The Disaster That Doesn’t Have to Happen: The Baton Rouge Flood of 2001,” 132
\[^{248}\] Ibid.
Ascension and Livingston parishes have made several amendments to their city ordinances since the floods of the early 2000s and have taken steps to prioritize safety in the aftermath of the 2016 floods as well. Notably, both amended their policies on standards for areas of shallow flooding to require new construction to occur at least 2 feet above the BFE and required construction within zones AH or AO to install adequate drainage paths around structures on slopes, to guide floodwaters around and away from lower or proposed structures.\footnote{Ascension Parish Code of Ordinances (2012) sec. A, art. 3. // Livingston Parish Code of Ordinances (2012) sec. 8, art. 5.} Livingston Parish enacted a procedure for determining areas of special flood hazard in 2012. The parish uses areas of special flood hazard identified by FEMA in its 2012 report and in the region’s FIRM issued on April 3, 2012.\footnote{Livingston Parish Code of Ordinances (2012) sec. 8, art. 5. // Washington D.C. FEMA. Letter of Map Revision #15-06-4438P. Effective 15 July 2016.}

Why are Ascension and Livingston able to get policies amended while East Baton Rouge has struggled? I suggest that it comes from different levels of civic engagement in local politics. As seen in the case studies addressed earlier, one of the major factors that has to exist for community-driven change is an effective advocate, whether that be in one individual or several organizations that come together to inspire individuals.\footnote{Mark Meo. "Strategic Policy Innovation and Flash Flood Hazard Mitigation: The Tulsa Story." \textit{Oklahoma Politics} 10 (2001): 93-102.} This was easier to accomplish in the significantly lighter populated Ascension and Livingston Parishes. This is not to say that there is no community activism in Baton Rouge, but that it is prioritized differently. Organizations like Together Baton Rouge do important work but they address all kinds of different problems, from Medicaid to criminal justice reform to food insecurity. They were able to be good advocates in the immediate aftermath of the flood, but also had to remain focused on other problems as they arose.\footnote{Together Baton Rouge, “Recent Accomplishments.” (2018). Accessed November 10, 2019.} Other organizations that focus on environmental issues like the Sierra Club have also made efforts to affect flood mitigation, but I would say that such single
issue focused groups may not have large success in a parish like East Baton Rouge.\textsuperscript{253} People in places like Central rally around community, around family. They are proud of their place in the parish as residents of Central, separate from the city of Baton Rouge and it is around that identity that change needs to happen. I believe that more directed community activism is why Central, when viewed as a singular entity rather than as a part of East Baton Rouge Parish, has seen successful local efforts. In the elections that followed the August 2016 floods, voters decided to replace the sitting mayor and the entire city council. The turnout of voters was remarkable and they were clearly sending a message. This was additionally interesting in that most residents that I interviewed stated that they supported the city council and the mayor during the flood event, especially when compared to the lack of immediate help sent by FEMA and the federal government. It was the aftermath and recovery that most individuals took fault with, including the proposed plan to construct new subdivisions. Many residents do not support increased development and feel they have a greater understanding of how floodplains function following the 2016 floods.\textsuperscript{254} This involvement of residents of Central in the local election is possible in a small community; it is much harder to rally all of East Baton Rouge Parish, or even all of Baton Rouge to come together in issues such as this.

There are many differences among Ascension, East Baton Rouge and Livingston parishes and many reasons why policy change has come together so differently for them. It is of great importance to integrate economic, political, environmental, and social specifics in community-based design and implementation policy change. These are all critical steps to achieve sustainable safe development. This implies the need for critical analysis of community contexts to recognize elements that have the potential to limit success and sustainability so that they can

\textsuperscript{253} Wayne Messina, interview by author, Central, July 22, 2019.
\textsuperscript{254} Kathi Cowen, Wayne Messina, interview by author, Central, June 13, 2019, July 22, 2019.
be dealt with preemptively.\textsuperscript{255} It is also important to recognize the resilience of, and more specifically the innovative nature of, local communities and to integrate as well as complement these bottom-up initiatives. The uniqueness of each community is important and has a direct effect on how change will best be implemented, especially change that is meant to endure. East Baton Rouge Parish could learn from the policies and amendments passed by its neighbors and would further benefit from collaborating directly with them. Even more useful would be the introduction of a basin wide approach to floodplain management instead of this piecemeal effort that we currently see in the greater Baton Rouge area, especially following the devastation of the 2016 floods. Several solutions are already widely discussed in the area, such as the controversially stalled Comite River Diversion Canal and the ill-fated Darlington Reservoir. Even more useful is the creation of the Amite River Basin Commission, though this would arguably be more of a blessing if the Commission was given regulatory authority at the basin scale. The other tool that separates East Baton Rouge Parish from its neighbors is the Stormwater Master Plan, published in 2018. The plan aims to understand how the parish’s natural and human-made stormwater systems perform, develop a plan that addresses the risks and impacts of local and regional flooding, and communicate the plan and engage the public.\textsuperscript{256} In its identification of problem areas in the parish, it highlights the City of Central between Hooper Road and Beaver Bayou to be one of the most pressing areas of concern and addresses the problems that arise from regional versus local flooding classifications. This document is the only document that addresses potential possibilities for climate change adaptation locally and can be


used to jumpstart better basin wide efforts.\footnote{Ibid. 9} East Baton Rouge Parish may have a professional leg up on the smaller Ascension and Livingston parishes, but there is no reason they cannot use the Stormwater Master Plan as something to strive for. Organizations and projects such as these would elevate the Amite Basin region to new levels of successful floodplain management that could set an example for the state as a whole. These ideas and other ways forward will be discussed further in the next chapter.
CHAP TER 5. MOVING FORWARD: CURRENT STATE OF ISSUES IN LOUISIANA FLOODPLAIN MANAGEMENT

It can be said that much of the damage that resulted from the 2016 floods resulted from a lack of proper preparation at all levels of government and among stakeholders. The situation at the time reflected the need for a massive overhaul of the National Flood Insurance Program, federal flood relief efforts and programs at the state level. Some headway has been made since 2016 at the state and local level with East Baton Rouge Parish’s draft Stormwater Masterplan Implementation Framework. Louisiana has extensive areas with a high risk for flood damages, especially in preparing for incidents of inland flooding. It is important to acknowledge the impact development has on the coast and on how practices at the coast affect more inland communities – especially as we see people migrate away from the coast and coastal influences. People fleeing the coast for what they think are safer inland communities, leads to skyrocketing development along areas vulnerable to riverine flooding. I have discussed how safe development and economic development have interacted and affected each other in the past, but what about looking forward to the future? There are several mechanisms that exist in Louisiana to promote safe development practices as the population of the greater Baton Rouge area, especially in Central, continues to grow. The National Flood Insurance Program has room for improvement and the Louisiana Comprehensive Master Plan for a Sustainable Coast is a game changer on the state level for project ideas that address flooding. In addition, the city of Central has begun to take the first steps towards a safer flood management system. Perhaps by better taking in to account the subtleties that effect safe and economic development can influence policymakers in

Central in a more positive way. While flood damage can be difficult to predict, there are concrete ways to move forward to better prepare for future flood hazards.

5.1. The National Flood Insurance Program: What is Happening Now?

As mentioned in prior chapters, the National Flood Insurance Program emerged in the aftermath of Hurricane Betsy, which struck in 1965. Congress passed the National Flood Insurance Act in 1968, and it gave rise to the National Flood Insurance Program. Almost 40 years later in August 2005, Hurricane Katrina hit New Orleans just two weeks before the fortieth anniversary of Hurricane Betsy. On one hand, it appeared that the public flood insurance program was doing its job: by May 2006, 162,000 Gulf Coast claims had been paid – over 95 percent of the claims which had been received by the federal government and the most claims the program had ever received.\[^{260}\] Furthermore, by August of 2006 a majority of the claims had been settled, paying out almost $16 billion in claims (this is not to say that it was by any means “easy.” Public programs, like the Road Home program were mired in delays and complications for long periods of time).\[^{261}\] However, because the National Flood Insurance Program was already running at a deficit, and several other floods and hurricanes struck that year, the program had to borrow almost $18.6 billion from the United States Treasury. Both policymakers and those affected blamed the government for neglecting to charge adequate rates to account for the true cost of losses.\[^{262}\] This makes the issue on whether the program was charging adequate premiums and how it spent those premiums seem especially relevant because of the increasing concentration of population and assets in flood hazard areas, along with the possible changes in

\[^{261}\] Ibid., 166
\[^{262}\] Ibid. 168
climate patterns that could increase the number and/or severity of floods in the future.\textsuperscript{263} It is clear that Hurricane Katrina exposed already glaring cracks in the system and catapulted them to the forefront of public discussions. In addition, claims that address instances of repeat flooding continue to cause the program much strife.\textsuperscript{264}

At the time of its inception, the NFIP’s coverage was available to buyers through specialized insurance agents; the Write-Your-Own-Program supplemented this starting in 1983.\textsuperscript{265} This program allows insurance companies to write and service the NFIP in their own names, absolving the companies of any of the risk. Today, the WYP issues almost all NFIP policies, with private insurance companies processing, paying, defending, and settling all claims, while the NFIP retains the responsibility to underwrite these losses.\textsuperscript{266} The WYO program’s intent is to be a win-win for the NFIP and private insurers since the program benefits from the insurance industry’s marketing channels and its automatic presence in flood-prone areas, while the WYO insurance providers do not shoulder any of the financial risk or burdens that come with such a program. The Government Accountability Office (GAO) published a report in 2010 assessing the long-term impacts of the WYO program, specifically addressing methods FEMA uses to determine the rates at which WYO’s receive payment, its bonus system’s adherence to financial control requirements and proposed alternatives to the current system.\textsuperscript{267} Three alternative administrative structures could replace the NFIP’s payment arrangement that could

\textsuperscript{265} U.S. Government Accountability Office (GAO). Flood Insurance: Opportunities Exist to Improve Oversight of the Write-Your-Own Program. GAO-09-455. (Washington, DC, 2009)
lower costs for administering claims and selling and servicing flood insurance policies. These include contracting with a single vendor, contracting with one or more insurance companies or contracting with multiple vendors and thus maintaining the WYO network. Several advantages and disadvantages exist in terms of the potential impact on the basic operations of administering flood insurance policies and adjusting claims, as well as on FEMA’s control of the program and its contractors. For example, contracting with a single vendor, as FEMA does under the current NFIP direct program, might be less expensive, but would almost completely remove insurance companies’ participation and their network of agents. Further, competitive bidding, which would arise from contracting with one or more insurance companies might lower FEMA’s costs for the program, but most insurance company officials at the time of the program’s inception said that they did not want to be federal contractors because of the regulations that would apply and emphasized that they had agreed to participate in the WYO program only because of its lack of a federal contract. Conversely, contracting with multiple vendors to service flood policies would allow FEMA to keep the WYO network and might make oversight more effective because FEMA would have a contractual relationship with significantly fewer companies. However, this structure risks encroaching on WYOs’ ability to use a subcontractor to administer their flood policies.\textsuperscript{268} Amending how the WYO program is set up could be a way for the NFIP to move forward.

Congress passed the Biggert-Waters Act of 2012 soon after GAO released this report. At the time, the newly passed act represented the solution to many of the NFIP’s woes. It raised insurance premiums to reflect the true cost of flooding. Removing discounts to many policies which being sold below actuarial risk targets and eliminating grandfathering of older rates were

\textsuperscript{268} Ibid.
among the changes. While this helped promote safe development practices by more accurately representing risk in the floodplain, it prompted a massive public outcry – led by developer interests in Louisiana. Congress quickly followed the public push back and passed the Homeowner Flood Insurance Affordability Act of 2014, which changed the process to alter subsidized premiums and reinstated grandfathering of lower rates, delaying the increases in premiums that had been proposed under the Biggert-Waters Act (it also called for further studies to be carried out). Moving closer to the present, at the time that Hurricane Harvey struck Texas, the NFIP was $24.6 billion in debt, and the Congressional Budget Office maintains that even without including the Hurricane Harvey relief, the program still possessed an annual budget shortfall of about $1.4 billion. In its 2017 report, the Government Accountability Office references the impact of the 2016 flood events in Louisiana, explaining that “FEMA, which administers the NFIP, owed $24.6 billion as of March 2017 to the Department of Treasury for money borrowed to pay claims and other expenses, including $1.6 billion borrowed following a series of floods in [Louisiana] in 2016.” Eliminating the debt could reduce the need to raise rates to pay interest and principal on existing debt. However, additional premiums still will be necessary to reduce the likelihood of long-term borrowing down the road. Affordability issues could stem from an increase in premium rates for some property owners and discourage them from purchasing flood insurance leading to other potential actions to help mitigate these challenges. It would also make selling properties in high-risk areas next to impossible, ensuring safer development. In addition, it does not stop economic development and would still encourage

270 Congressional Budget Office, *The National Flood Insurance Program: Factors Effecting Actuarial Soundness* (November 2009), Pg. 2
development into floodplains, rather than promote safer development practices. In Louisiana as a whole, a pressing issue centers on a shift on the coast from residential to expensive, self-insured camps of sportsmen.

While much of the buildup of the NFIP debts came from the onslaught of natural hazard events that have plagued the eastern seaboard and Gulf of Mexico in recent years, the NFIP’s ongoing shortfalls and inability to become solvent can be attributed to premiums that are not actuarially sound, lack property owner participations, and the continuation of federal subsidies that attempt to balance affordability with program stability.272 While the Congressional Budget Office pins the shortfalls on FEMA’s underestimation of expected claims and the cost of charging discount rates for certain policies, the previous discussion in this thesis demonstrates how a lack of adherence to safe development policies also contributes to some of the program’s failures. As seen in the greater Baton Rouge area, development has been growing in high-risk areas, despite the knowledge of potential destruction that may result from this process. Some of the most recent policies passed in East Baton Rouge Parish and the surrounding parishes demonstrate that it is possible to reconcile safe and economic development at the local level (such as the buyout of Silverleaf Street in Gonzalez), so the NFIP can and should attempt to follow that lead. In addition, the 2019 GAO report shows that areas most directly affected by flood hazards have a fair number of repetitive loss properties present.273 According to a 2018

report from the American Action Forum, there is a way forward to make amendments to the program to help ensure it is stable to provide useful assistance for future disaster relief.274

One potential way forward is to expand the size of the coverage pool of those seeking flood insurance. As of 2007, only about 53 percent of properties that fell within Special Flood Hazard Areas (SFHA) actually were insured. Many of these were those that required insurance with their mortgages.275 The large number of uninsured properties means an increased need for direct aid from FEMA in the wake of a hazard event; to reduce this it is necessary to convince those who self-insure or avoid paying back loans to purchase insurance. However, from the view of the insurance industry, the fewer properties that have flood insurance means the less revenue each month to cover the costs of claims payouts. To remedy this shortfall will require increasing the number of NFIP policyholders, not only to raise the level of compliance among property owners situated in SFHAs, but to raise the amount of premium revenue coming into the program. This would boost safe development practices, because even though people remain in the floodplain, giving them better access to insurance would increase their resilience and reduce the trauma of recovery. The NFIP’s debt to taxpayers could be reduced by driving growth in sectors like the mortgage industry that falls short of compliance requirements. This will not only help spread risk among more stakeholders, but will also increase program income. However, the issue of what constitutes the floodplain still persists. The NFIP determines SFHA’s by using the so called 100-year floodplain. This concept causes confusion because the general population often misinterprets it to mean that a flood will inundate the area once in one hundred years, when it is really an indication probability not frequency. This misunderstanding encourages home buyers to

invest in risky areas. The relatively short record of flooding and the increasing frequency of devastating floods due to climate change undermines the reliability of existing FIRMS. To accommodate the well-known inadequacies of mapping risks, adopting the 500-year floodplain as the SPHA would greatly expand the risk pool and enable reduced premiums with more people enrolled.

Another option would be to revise rates to accurately reflect risk. There have been several attempts to do so thus far (i.e. Biggert-Waters Act, Homeowner Flood Insurance Affordability) that have not been successful. A 2018 study found that premium rates rely on inaccurate data, making it impossible to calculate accurate premiums. Inaccuracies stem from the fact that flood risk data is often outdated by the time it is published. To bridge this gap it is important to understand the difficulties in calculating accurate premiums. Unlike other forms of insurance, like property or health insurance, policy holders usually submit claims in large batches, straining reserves. Since losses are low in some years but extremely high in others, it is difficult to predict payments year to year. Further confounding matters is the program’s subsidies for low-income areas. Congress has set ceilings on premium increases to make flood insurance affordable for all at-risk properties, but the caps are too low to keep the program afloat. Also present are full-risk premiums, which means that they should cover the cost of any given flood event. Instead, these premiums only account for the amount of a loss relative to the historical average loss per year. This does not take into account years with uncharacteristic, catastrophic losses, such as the 2016 Louisiana floods. To help rectify this deficiency, the NFIP should update its FIRMs to

more accurately inform buyers and builders of the risk to their property and base its pricing accordingly. Safe development practices would include accurate FIRMS and premiums to ensure people are aware of the risks they face. Furthermore, phasing out the outdated grandfathered premium rates that came from previous politically charged flood risk zone reclassifications would restore accuracy to premium rates. The program might hold existing policyholders to increases, but with reasonable and affordable caps.

A 2017 study asserts that sharing some of the risks with the private insurance market would offer a viable adjustment to current procedures – similar to how the WYO program could be amended. Increased participation of private flood insurers could reduce the NFIP’s exposure to flood risk. The NFIP’s exposure to risk would decline and it would also allow FEMA to focus on emergency relief work and flood risk mitigation while letting the market focus on underwriting flood insurance policies. The development of a fully privatized flood insurance market highly unlikely on account of the volatile nature of flood risk. However, there are options that would allow for efficient risk sharing. For example, there might be a combination of feasible options in which private insurers either provide primary coverage to a majority of policyholders, or they acquire the transferred risk from the NFIP by way of reinsurance, or private insurers and the NFIP jointly underwrite primary flood risk and pool any reinsurance. In any of those cases, the NFIP could act as a reinsurer of last resort or could provide primary insurance that is focused solely on residual market risks left over from what private flood insurers could not or would not underwrite. This would prevent too many private companies from getting involved, making where and when FEMA should step in much clearer.

Lastly, the NFIP would benefit greatly if it updated its program technology. It is currently relies on technology and processes dating back to the 1960s when the program began. For example, no fully accessible central database of the flood elevation data exists, meaning homebuyers in SFHAs are required to purchase a new elevation certification that must be completed by a surveyor each time a property is bought and sold. Many of the costs that may prevent people from buying into the NFIP have the potential of being reduced by simply creating a central repository for flood zone data or allowing homebuyers to rely on GPS data instead of requiring a physical surveyor (which could put undue costs on the potential homebuyer). In addition, the NFIP should introduce a secure platform for processing claims, business analytics, and customer care. Private insurers already have these real-time systems that are faster and more accurate than those used by the NFIP and FEMA which often provide data and reports that are dated by several months, not uncommon for many federal programs. FEMA and the NFIP could help lead the way to better policies that do a better job of promoting safe development practices.

5.2. Local and State Level Management

When it comes to floodplain management in Louisiana, the crowning jewel of the state plan is the Louisiana Comprehensive Master Plan for a Sustainable Coast (Master Plan). This document has been published every five years since 2007 and outlines responses to the loss of coastal land and threats from storm surge events (though it does not directly address inland riparian flooding). Because funding is not yet secured for all proposed projects, the Master Plan identifies a long-term program of construction, operations, and maintenance guided by a dynamic planning process. This is a concrete way for the state of Louisiana to adhere to safe

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281 Ibid.
development policies, since the plans incorporate many of the traits outlined in Table, 1.1. One of the principal objectives of the Master Plan is flood protection in coastal areas, with the goal to reduce economic losses from floodwaters as a primary concern.\textsuperscript{282} One of its weaknesses, however, is that it does not apply to coastal areas or territory that likely will become coastal or address relocation as an option. Its core objective is a good way to reconcile the sometimes conflicting concepts of economic and safe development. Safe development does not necessarily mean that no development can take place in a floodplain; it simply means that any development should not put populations at undue risk to flood hazards. This approach is doable if effective planning takes place at several levels of government and industry, which is what the Master Plan is trying to accomplish for coastal areas. While the Master Plan focuses on the coast, its concepts could translate to the issues that Baton Rouge faces inland as well, especially when the effects of rising sea levels begin to be seen in the lower Amite River basin. Most importantly, the Master Plan operates at a large geographic scale since it covers the entire coastal region of the state, transcending any single parish or basin. Of the several implementation methods it considers, perhaps the most useful for inland settings are the ideals of flood risk outreach and education. To promote a more holistic flood risk reduction strategy, the CPRA has prioritized outreach and education.\textsuperscript{283} It encourages flood risk awareness and promotes access to resources that can help communities reduce their flood risk. In addition, CPRA published a pocket guide book entitled, \textit{Pocket Guide to Funding Resources: Reducing Flood Risk for Homeowners + Renters + Business Owners}, which aims to provide residents with up to date information about current

\textsuperscript{282} Coastal Protection and Planning Authority (CPRA). \textit{Project Definitions: Louisiana’s Comprehensive Master Plan for a Sustainable Coast} (Baton Rouge, LA: Office of the Governor, 2017), 64.
mitigation programs and connect interested individuals with resources to reduce their flood risk.\textsuperscript{284}

While the future conditions of coastal and inland Louisiana are highly uncertain due to the dynamics of riverine and marine processes, storm events, climate change, population growth, economic activity, and ongoing human dependence on the natural resources in the coastal waters, managing such a complex system in which the natural and socio-economic systems are highly integrated can be planned for in the long term. Moreover, planning in advance allows economic interests to be met without sacrificing safe development principles. To reiterate, development can occur in floodplain areas, but it must follow safer practices that take actual flood risk into account. In addition, coastal environments and populations that are adjacent to significant water sources or natural resource based economies face unique challenges due to the interdependence and delicate balance of water, land, and economic systems and the future uncertainties associated with the magnitude and rate of climate change impacts. Again, while the Master Plan addresses coastal hazards these same issues are at the forefront of communities further up the Mississippi and Atchafalaya rivers. This relationship will hold especially true if sea-level rise encroaches on coastal communities, transforming communities that were once inland into coastal settlements.

Adaptive management is a scientific application and encourages the integrated and flexible approach to land and water management that considers risk and uncertainty.\textsuperscript{285} It promotes monitoring management practices and making adjustments as evidence reveals either strengths or weaknesses of practices, all in pursuit of solutions that are sustainable, even in the face of changing conditions. Connecting short-term investments with long-term challenges and

\textsuperscript{284} Coastal Protection and Planning Authority (CPRA). \textit{Project Definitions: Louisiana’s Comprehensive Master Plan for a Sustainable Coast} (Baton Rouge, LA: Office of the Governor, 2017) Pg. 157

\textsuperscript{285} Coastal Protection and Planning Authority (CPRA). \textit{Louisiana’s Comprehensive Master Plan for a Sustainable Coast} (Baton Rouge, LA: Office of the Governor, 2017) Pg. 149
the selection of action pathways that allow for maximum flexibility of future decisions are two of the key concepts of adaptive management. Adaptive management relies on ongoing monitoring and adjustments as conditions change due to management practices. This figure from the Master Plan demonstrates how CPRA plans to go about enacting change that does not have a static goal. The best way to do this is to build institutional knowledge as science evolves and as communities learn from past hazards. Adaptive management can formalize communication and institutionalize continual growth of knowledge as uncertainties become resolved and lessons are learned. This can be well integrated in safe development practices in Central and should be considered as the community expands. Better engaging stakeholders is an important step to accomplish safe development, as community backing of proposed policies is essential to successful implementation, in addition to being an invaluable part of the research process since they can provide the best first-hand, on-the-ground knowledge.

Figure 5.1. CPRA’s Adaptive Management Activities. Source: CPRA’s 2017 Master Plan for a Sustainable Coast
5.3. *Central Three Years Later: Next Steps*

Preceding chapters discussed the changes in Central’s city ordinances and how the surrounding parishes of Ascension and Livingston have implemented safe development changes in their flood policies through buyouts and fill requirements. It is important now to check in with where Central stands now. How prepared would the city be to deal with a similar event if it were to occur in the near future?

While massive change has yet to materialize in Central, small informal steps have been made. When Hurricane Barry threatened the city in July 2019, the preemptive response was swift, with city officials, parish officials and private citizens came together to clear drainage channels and able to take on large volumes of runoff should the need arise. All those interviewed stated that they had retained flood memories from the events of 2016. People stated that they had marked where the floodwaters rose in their homes and made sure to prepare storage space above those lines to ensure that in the case of another inundation, their possessions would not be damaged. At the first sign of a heavy rain people begin to watch the speed of the rising water and plan for a worst-case scenario. In the aftermath of a disaster it is important to assess a community’s resilience, its ability to bounce back. In an interview Congressman Garret Graves emphasized the importance of making communities in East Baton Rouge Parish resilient, speaking to the importance of maintaining a sense of community in the wake of disaster. He asserts that it is not possible to expect individuals to choose to stay and rebuild in an area that cannot adequately respond to disaster. He cites securing $10 million for the completion of the Comite Diversion Canal Project and the Baton Rouge Area Flood Control project as critical to helping to increase future resiliency since it would enable people to stay and rebuild in place.

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286 Vicki Burt, interview by author, Central, October 17, 2019 // Casey Bennett, interview by author, October 7, 2019
The state also received $1.2 billion from HUD for implementing flood mitigation measures, such as stemming development in flood prone areas and for speeding up rebuilding efforts for areas including Central. These funding streams are a blessing to the state for several reasons. In the wake of experiencing a disaster, a community has to bounce back even stronger, not just at the same level as before and these projects help propel greater Baton Rouge and the state as a whole to undertake projects that can prioritize safe development without sacrificing economic gains.

Another major way to move forward is through basin-wide management. As discussed previously, basin-wide river management has been fairly successfully achieved in places such as Tulsa, Oklahoma and Rapid City, South Dakota. Basin wide management efforts in the United States see their roots in Miami Valley and, later, the Tennessee Valley Authority (TVA). Originally conceptualized as a holistic river basin management effort, Congress authorized the TVA in 1933. In its early stages it strove to construct dams for power, flood control, and navigation in addition to providing assistance to farmers to help conserve soils, support farmers’ cooperatives, support safe development of new communities, and foster civic participation in local issues.287 Its most ardent supporters argued that the basin’s unifying authority provided major economic benefits to the region; the TVA could coordinate developments upstream and downstream and prioritize the hiring of professionals who possessed an understanding of how to make these goals a reality.288 However critics argued that this idealized holistic management did not occur. It is often said that the TVA advanced national interests at the expense of regional ones, a result of its status as a federal agency.289 It flooded huge areas of the valley, causing mass displacement and largely abandoned its regional planning and flood control mission to provide

288 Ibid. Pg. 61
289 Ibid. Pg. 63
electric power, with the agency becoming so fixated on power production that it undertook a buildup of coal and nuclear power while paying little attention to environmental concerns.\textsuperscript{290} The TVA has not been without some lasting benefits when it comes to flood mitigation however. Today, the TVA employs an impressive system of dams to control flooding along the Tennessee River watershed, preventing about $260 million in flood damage in the TVA region and along the Ohio and Mississippi Rivers each year. To date, the operation of this system has prevented over $5.4 billion in flood losses across the Tennessee Valley, including about $4.9 billion in damage averted at Chattanooga—the most flood prone city in the Tennessee Valley.\textsuperscript{291} The downfall of the TVA as an engine for local change was in its founding; it was a national machine, created to uphold national interests. For success on the basin scale, efforts must be kick started at the local level.

The Amite Basin does have the Amite River Basin Commission, with the major drawback being that the ARBC does not have any basin-wide regulatory authority. The stated goals of the ARBC are to “mitigate flood damage in the Amite River Basin, with the commission serving as a multi-parish authority to accomplish flood control measures; facilitate cooperation among federal, state, and local governing bodies to foster floodplain management; maintain and operate structures built under the purview of the Commission; and coordinate river management within the basin.”\textsuperscript{292} They have put out reports on proposed solutions to flood hazards in the area such as an overall floodplain management report and a report in the wake of the 2016 flood.\textsuperscript{293}

Until the ARBC receives regulatory oversight authority, it will not serve as an actual force for effective change, though it may be able to function partially as an advocacy body.

The recently launched Louisiana Watershed Initiative shows a higher degree of promise when it comes to enacting tangible change on the front of basin wide river basin management. In response to the 2016 floods, Gov. John Bel Edwards tasked several state agencies with coordinating their efforts to develop a new approach to reducing flood risk throughout Louisiana. The early stages of this included efforts ranging from the development of hydraulic and hydrologic models to the development of watershed coalitions in coordination with parish, state and federal entities. Over the course of this two-year period, the state and its partners have made stunning progress and many findings have emerged that are helping to inform the state’s shift from mitigating flood risk jurisdictionally to one that more directly takes into account the flow of water and basin wide boundaries. While this is not necessarily a policy-based solution, it is a way forward that directly marries safe and economic development practices with its focus on sound engineering techniques and increasing the entire Amite Basin’s resilience to flood hazards.

The Louisiana Watershed Initiative brings together stakeholders at several levels of government, with participating organizations including the Office of Community Development, the Coastal Protection and Restoration Authority, the Governor’s Office of Homeland Security and Emergency Preparedness, the Department of Transportation and Development and the Department of Wildlife and Fisheries. Other local solutions to basin-wide floodplain management can be seen in the Coastal Sustainability Studio at LSU. The Studio currently

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oversees the Inland from the Coast Project (IFC), which looks to model present and future environmental conditions, community well-being research and applied building, community, and landscape design for ongoing flood recovery and long-term resilience across the greater Baton Rouge inland-coastal region.\textsuperscript{296} The project works with the Water Institute and the OCD to explore local solutions, with efforts underway to consider basin wide approaches. In addition, community-based participatory efforts are an excellent way to move forward. Many people interviewed for this project have cited how the floods have given them a renewed sense of civic duty, in that they feel that they are making a different by attending parish council meetings and other gatherings that deal with recovery from the floods. Many of them stated that they would continue to participate and encourage others to join them at city hosted events that were to discuss development in to the flood zone.\textsuperscript{297} This multi-scalar approach is a way forward in an increasingly interdisciplinary field. Collaboration from organizations like the Water Institute, the OCD, the Coastal Sustainability Studio, the Amite River Basin Commission, and the Louisiana Watershed Initiative can pair with local knowledge to be able to inject life into safer development practices with methods that actually suit the specific community and basin in which they operate.

\textsuperscript{296} LSU Coastal Sustainability Studio. “Inland from the Coast – A Multi-Scalar Approach to Regional Climate Responses.” Accessed at: \url{https://css.lsu.edu/project/inland-from-the-coast/}

\textsuperscript{297} Vicki Burt, interview by author, Central, October 17, 2019; Wayne Messina, interview by author, , Central, ; Casey Burnett, interview by author, Baton Rouge, ; John Didier, interview by author, Central,
CHAPTER 6. CONCLUSIONS

The major questions this thesis sought to answer were: (1) Do local and federal government policies inhibit or enable development into the floodplain? and (2) How have the policies effecting Central addressed safe versus economic development since the 2016 floods? Through interviews and an analysis of public policies and ordinances this thesis has shown that despite policies prioritizing economic development, the two poles of the paradox spectrum can be reconciled when it comes to the floodplain. As discussed in Chapters 3 and 4, most of the policies in East Baton Rouge Parish historically fall on the side of promoting development into the floodplain rather than slowing it or ensuring safety. However, following the events of 2016 and a more engaged public, there have been steps to move toward a paradigm of safer development practices. This can be directly seen in more recently passed policies, especially in Ascension and Livingston parishes, giving hope to the idea that change can come in Baton Rouge. Through the interviews conducted, it is clear that perceptions around flooding are critical to forming more sustainable solutions.

Because of the dependence on FEMA flood insurance, I do not expect local residents to rely strictly on state/local government for flood recovery, but rather they would assert that floodplain management needs to occur across different levels of government. The results of this analysis indicate that flood mitigation policy evolved slower than development into flood-prone areas, allowing an increase in properties at risk over time due to the absence of publicly driven mitigation strategies. The 2016 flood exposed this situation and prompted the recent growth in public concern. The results of my thesis helps reveal in a fine-grained way the government policy adjustments after major flooding events. By doing so, I hope, it will also
assist with government efforts, especially in Central, to identify steps to mitigate risk and exposure

As demonstrated in Chapter 2, much of the literature already published on this topic focuses on flooding, government policies, and community resilience. The papers and studies look at how expansion into flood prone areas effect a community’s ability to bounce back from repeated floods, government policies that relate to flooding, and how vulnerability effects different communities. However, there is a lack of literature that addresses the short-term policy response to disruptive floods. Furthermore, there has been little attention directed toward bridging the gap between the paradoxes of safe and economic development in floodplain management.

Reflecting on my methodologies, I am confident that utilizing qualitative research methods was the most effective course of action. The combination of analyzing public policies in Central, utilizing similar case studies from around the country, and interviewing residents locally enabled the assembly of a well-rounded account of the current state of floodplain management in the region. If I had relied solely on policies or case studies I would have missed much of what makes Central unique and the important role that community activism plays in jumpstarting policy change, especially at the local level. By simply looking at the speed of development in East Baton Rouge Parish without having an understanding of the people who choose to make their homes in these areas and the choices they make that keep them there, even in the face of disaster, would be an incomplete picture. In addition, it is important to remember that it is not just new development that needs to be taken into account, but making adjustments for existing structures and policies to create immediate results in the fight for more effective flood policy. I have made an effort to chart a path toward making some of these connections – to demonstrate
the lack in evolution of government policy at the speed of development into flood prone areas and show that economic well-being does not have to come at the expense of community safety. It is the government’s role to protect the people it serves, but to do so, it must grow and expand, as its residents expand into the floodplain.

These conclusions also have implications beyond the scope of this study, illustrating the importance of community resiliency in the face of natural hazards and human-induced disasters, especially when it comes to floodplain management. The resilience demonstrated by the people of Central and the slow change in how governments respond to flood hazards can serve as an example of how floodplain management must evolve faster to match development in individual areas. Safe development does not have to come at the expense of economic gain; the two ideas can and must be reconciled and recent developments in the state such as the Louisiana Master Plan for A Sustainable Coast, the Louisiana Watershed Initiative, the Amite River Basin Commission, and even simply advances in community policy are examples of how times are changing. However, Central’s struggle is not a singular event—it is an indicator of hazards to come and how policy change has to begin from the bottom up. The country has watched Louisiana drowned by the very water that sustains it time and time again; perhaps observers can also look to communities in Louisiana, like Central, as an example of how to respond to large-scale disruptive events as it continues to recover and grow.

The major goal of this study was for the people of northern Baton Rouge, especially the community of Central, to have a better grasp on how they can more efficiently respond to floods. My hope is that the municipal government of Central will take the information presented here and attempt to apply some of the policy changes recommended before another flood inevitably barrels through and ravages the area.
APPENDIX A. INFORMED WRITTEN CONSENT FORM

1. Study Title: Changing Geographies of Flood Mitigation Policies: A Case Study of Central, Louisiana

2. Through this study the researcher hopes to learn about residents of the town of Central and their expressions pertaining to the 2016 Baton Rouge floods through first-hand accounts. All conversations will be kept entirely confidential by the researcher. The interviews will be tape-recorded and then transcribed into a secure computer file. Your participation is voluntary and it is not necessary to answer all the questions. It is the researcher’s hope that the results of this study will be used to inform better policy decisions in Central. Your time commitment will be about 1 hour.

3. Risks: There is only minimal risk associated with this study. Transcriptions of interviews will be kept in the principal investigator’s office and identity will be kept confidential unless permission is expressly given by participant.

4. Benefits: There will be no monetary benefits but participants will gain an understanding and appreciation for the flood policy planning process and have a greater sense of involvement in their community.

5. Alternatives (if applicable): N/A

6. Investigators: You may contact Ria Mukerji or Dr. Craig Colten for questions about this project. Ms. Mukerji is available from 8:00 AM to 7:00 PM and Dr. Colten is available from 11:00 AM to 2:00 PM, Monday – Friday.

7. Performance Site: Central, Louisiana

8. Number of subjects: 15

9. Subject Inclusion: Any person who resides in Central, Louisiana and has either flooded in the past or lives in the flood zone is eligible to participate.

10. Right to Refuse: Subjects may choose not to participate or to withdraw from the study at any time without penalty or loss of any benefit to which they might otherwise be entitled.

11. Privacy: Results of the study may be published, but no names or identifying information will be included in the publication unless permission is expressly given. Subject identity will remain confidential unless disclosure is required by law.
12. Signatures: The study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigators. For injury or illness, call your physician, or the Student Health Center if you are an LSU student. If I have questions about subjects' rights or other concerns, I can contact Dennis Landin, Institutional Review Board, (225) 578-8692, irb@lsu.edu, or www.lsu.edu/research.

I agree to participate in the study described above and acknowledge the investigator's obligation to provide me with a signed copy of this consent form.

Subject Signature: _______________________________ Date: ________________

Ria Mukerji: 909-680-9872, rmuker1@lsu.edu, 236 Howe-Russell Geoscience Complex
Dr. Craig Colten: 225-578-4420, ccolten@lsu.edu, 259 Howe-Russell Geoscience Complex
APPENDIX B. INTERVIEW QUESTIONS

Interview Topics and Questions

1. Where are you originally from? Did you grow up in Louisiana? Where (which parish)?
2. How long have you lived in Central?
3. Did you flood in 2016?
4. What are your perceptions of flood risk in this area? Do you feel in danger?
5. Did you feel that your local government did enough to help with the recovery process?
   • If not, what do you think they could have improved upon/how could they have been more helpful to you specifically?
6. What has been the impact of any government implemented programs in your community, if any?
7. How have you been involved in the flood recovery process?
8. What aspects of your community do you find so important that you would move away if they were lost?
9. What about your community makes you feel safe?
10. Do you feel like you have a voice in your local government?
11. How involved are you in your local government?
12. Do you think an event similar to 2016 could occur again in the near future?
13. What is your tipping point? In other words, was the 2016 event, “the last straw?” Would you leave Central if another similar storm came through?
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VITA

Ria Mukerji was born on April 22\textsuperscript{nd} 1994 in Chino Hills, CA. She completed her undergraduate studies at the University of California, Santa Cruz (UCSC), graduating in 2016 with a Bachelor of Arts in Environmental Studies and a minor in Politics. While at UCSC she spent a semester abroad in Accra, Ghana where she first came to discover and become passionate about the field of geography while studying the Akosombo Dam and Volta River. After graduating, Ria served an AmeriCorps term in Santa Cruz at the Volunteer Center of Santa Cruz County as a Community Engagement Fellow. Following the conclusion of her AmeriCorps term, she worked in environmental education at Santa Cruz County nonprofit, The Watsonville Wetlands Watch. She then ventured south to Baton Rouge to pursue her Masters in summer of 2018. Highlights of her academic achievements while at LSU include being named the first place winner of the Graduate Student Poster Competition at the 2019 conference of the Southwestern Association of American Geographers and serving as a GA at the LSU Coastal Sustainability Studio for the duration of her time at LSU. She plans to receive her M.S. from LSU in Spring 2020.