

Adaptation to coastal environmental change in Louisiana: An analysis of local and state
environmental governance relationships

by

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Abstract

Coastal Louisiana has lost over 1900 square miles of land since 1932, causing the collapse of ecosystems and threatening the well-being of human populations. However, Coastal Louisiana is not impacted solely by land loss, but rather multiple anthropogenic and non-anthropogenic mechanisms that are causing rapid environmental change to occur across the region. Recent estimates place the economic costs of environmental change in Louisiana's coastal areas at \$37 billion by 2050. This study examines the alignment of adaptation strategies employed by the State of Louisiana, and Lafourche, Terrebonne, and Plaquemines Parishes. In a case study analysis, I utilize key actor interviews, document analyses, and participant observation. Expanding upon a categorical framework of community responses to environmental hazards, I developed six categories of possible community responses to environmental change. Using this framework, I analyzed the alignment of environmental policies employed by the state and local governments in Coastal Louisiana. When analyzing documents alone, results indicate that parishes and the State of Louisiana are aligned when choosing and implementing environmental change adaptation strategies. However, an analysis of key actor interviews within the parishes reveal greater variation in adaptation strategies pursued at a local scale. My findings indicate that this variation of adaptation strategies at the local scale can be explained, in part, by local political and industrial influences. Additionally, I found that the Coastal Protection and Restoration Authorities emphasis on using technical solutions as the preferred adaptation strategy, fails to account for the agencies goal of protecting unique cultures. This work advances scholarship in political ecology, and climate change adaptation literature, by expanding the possible community adaptation responses, answering the complex questions in climate change literature, and examining the impacts of politics on responses to environmental degradation.

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Dedication

For Maggie Borders, thank you for being the first person to see the diamond in the rough, your continued guidance, mentorship, and friendship has helped shape the man I am today.

Chapter 1 - Background

1.1 Introduction

Coastal Louisiana supports nearly 30 percent of the United States fisheries, as well as migratory wintering duck habitats. This area comprises 17 parishes that account for 44.3 percent of Louisiana's population, and 44.4 percent of Louisiana's employment (Richardson et al. 2004). The region of Coastal Louisiana resides where the Mississippi River meets the Gulf of Mexico, creating a deltaic zone better known as The Mississippi River Delta. The Mississippi River Delta provides between \$12 billion to \$47 billion annually in economic returns to the local populace. (CPRA 2017). Used in an economic fashion, the Mississippi River Delta generates between \$330 billion to \$1.3 trillion annually (CPRA 2017). Globally, deltaic regions have experienced land gain despite sea level rise (Nienhuis et al 2020). However, the Mississippi River Delta in Louisiana is a unique case study, because the region is experiencing a change from freshwater marshland to saltwater marshland, and open ocean at a rate of 16.7 square kilometers (10.37 square miles) annually (Couvillion et al. 2018).

Examples of environmental change in the landscape of Coastal Louisiana are demonstrated in the following figures. Depicted below in Figure 1-1 is an example of marshland decline, where the strips of land are the very last part of the marsh that eroded from the inside out. Also shown below in Figure 1-2 is a Cypress tree forest that is dying from saltwater

intruding into the tree's environment.



Figure 1-1 Marsh Decline (The last strip of land left from a marsh experiencing marsh collapse)



Figure 1-2 Cypress Forest Collapse (Depicts Cyprus trees that are dying due to saltwater intrusion)

Between the years 1932-2000, Coastal Louisiana has lost a total of 1,880-1,900 square miles of land. Furthermore, an additional 700-1,750 square miles of land is expected to disappear over the next fifty years (see Costanza et al. 1990, Tibbetts 2006, Morton et al. 2010, Couvillion et al. 2013, Nyman et al. 2013). Coastal Louisiana is already experiencing ecosystem decline, and as environmental change continues to progress, the region will experience complete ecosystem collapse (Louisiana Department of Natural Resources 1998) When I discuss environmental change further in this document, I am referring to environmental change as a holistic complex issue comprised of multiple mechanisms, impacts, and feedback loops.

In response to the environmental change occurring in the region, the State of Louisiana has produced the State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast (Master Plan hereafter), which allocates \$150 Billion in the next 50 years to combat environmental change (CPRA 2017). The plan includes 124 projects that will build or maintain 800 square miles of land, resulting in the reduction of environmental damages by \$8.3 billion annually over the next 50 years if implemented. The 124 projects are spread across three coastal zones including multiple government jurisdictions. However, the Master Plan fails to include parish driven adaptation initiatives and policies. Much of the scientific literature examining environmental change focuses on case studies that analyze the physical impacts, social impacts, and specific responses to environmental change. As a result, scientific literature fails to examine environmental change on broad scale, thus creating niche fields of scientific study.

Although the Coastal Protection and Restoration Authority of Louisiana (CPRA hereafter) provides adaptation projects and recommendations that differ based on geographic location, there is still a gap where academic research fails to examine the variety in adaptation strategies that are employed by parishes, as well as, how parish adaptation initiatives align with

the recommendations of the Master Plan. Adaptation is defined as the choice a person, and or a community has when responding to environmental degradation (Warner et al. 2010). Using a multi-sited comparative case study analysis this study aims to answer the following the research question; *how do local adaptation strategies align with the State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast?*

My study will focus on identifying how local governments in Coastal Louisiana have responded to environmental change, and how those practices align with larger state policy. I have developed three objectives to answer this question:

- 1) *Compare how local and state governments align in their pursuit of adaptation strategies to environmental change.*
- 2) *Identify the perceived constraints that local government face in choosing an adaptation strategy.*
- 3) *Identify the perceived threats from environmental change by local governments in Coastal Louisiana.*

After reading relevant literature, I hypothesize that *environmental change adaptation strategies employed by local parishes vary between parishes, and the State of Louisiana because of the variation in social context*. Additionally, to test my hypothesis I adapted Warner et al (2010)'s conceptual framework to characterize adaptation strategies found in local parishes and the State of Louisiana environment policy documents. Using a multi-sited comparative case study analysis, I compare local parish adaptation strategies to other parishes adaptation strategies, and local strategies with the State of Louisiana's chosen adaptation strategies. When selecting the study sites for my multi-sited comparative case study I selected three parishes that

practice a variety of chosen adaption strategies. Additionally, I conducted an exhaustive literature review to fully conceptualize the context surrounding my research question.

1.2 Literature Review

During preliminary research, I examined popular media, specifically newspapers to describe how local communities are impacted by environmental change. Examining local news sources provides a narrative that depicts the story of environmental change according to local perceptions. I also examined peer reviewed academic literature, and state/federal environmental policy documents. By examining multiple categories of literature, I learned that the environmental change occurring in Coastal Louisiana is a complex issue spanning multiple scales across time and governance.

1.2.1 Policy Development and Environmental History

The Mississippi River has always been a great asset, and threat to communities residing along the river's banks. In 1927, The Mississippi River flooded the United States extending from Illinois to New Orleans, breaking through newly built levees in 147 places (Marshall 2014). In total 27,000 square miles were under 30 feet of water, and approximately 600,000 people were displaced (Marshall 2014). At the time, the Great Flood of 1927 was the worst natural disaster to strike the United States, and in response, Congress passed the Flood Control Act of 1928. The Flood Control Act of 1928 tasked the U.S. Army Corps of Engineers with preventing floods of this magnitude from occurring again. In response to the Flood Control Act of 1928, the U.S. Army Corp of Engineers channelized the Mississippi River (Marshall 2014). Although the channelization of the Mississippi River protects citizens from flooding, the channelization of the

river also denies the Mississippi River Delta (MRD hereafter) the sediment deposition needed for delta sustainment and growth. If channelization was the only anthropogenic impact on the delta, scientist debate that the size and extent of the delta in 1930s would still exist in present day (Marshall 2014).

Also during the 20th century, the oil and gas industry discovered plentiful reserves of resources stored below the MRD. The newly found oil and gas reserves resulted in extensive channel cutting and carbon extraction of the MRD (Grow Louisiana Coalition 2017). During this period, wetlands were considered worthless; they were a place where people rarely could live or wanted to live. Furthermore, environmental laws to protect the wetlands from industry practices did not exist during this period (Marshall 2014). Without policies in place to stop the oil and gas company practices, industries were able to choose drilling sites based on ease of access, and often created dredge canals along waterways to transport infrastructure.

During the early 20th century nearly 50,000 oil wells were built in the coastal zones, with almost 10,000 miles of canals dredged for support infrastructure (Marshall 2014). Although the State of Louisiana started requiring permits for such activities in 1950, it was not until the implementation of the Clean Water Act of 1972 that active monitoring of oil and gas company practices occurred. Since 1930, Louisiana has lost nearly 1,900 square miles of land. The State Louisiana started to address the loss of land in the mid-1970s, with many plans and studies being produced by technical experts, citizen's groups, and state/federal agencies.

The period between the 1960s-1970s is when the American public became concerned about the environment in multiple ways, notably, the American public focused on the preservation of America's wilderness and natural landscapes (Gordon 2012). Although the modern environmental movement is characterized by multiple changes in environmental policy,

two changes directly impacted the coastal lands of Louisiana. First, in 1970, is the creation of The National Oceanic and Atmospheric Administration (NOAA hereafter) (NOAA Central Library 2007). NOAA was created to monitor and improve ocean conditions and has the authoritative power to enforce the sustainable usage of resources regarding coastal and marine ecosystems, while supplying environmental information to the public (NOAA 2020). Secondly by 1972, the United States Government passed The Clean Water Act of 1972, which would have a significant impact on Coastal Louisiana's wetlands (Cook et al. 2020).

The Clean Water Act of 1972 (CWA hereafter) is a piece of legislation concerned with water pollution and protection of American waterways. The CWA was the result of an amendment to the Water Pollution Control Act of 1948, and gave the Environmental Protection Agency the authority to enforce and change water quality policies (Cook et al. 2020, EPA 2020). The CWA was designed to reduce pollutants in surface waters, and uphold a standard of water quality in the United States. The CWA forced the removal of point source pollution pipes, oil wells, and addressed water quality issues. As a result, oil and gas industry standards changed forcing companies to change practices. For example, oil and gas companies were required to comply with federal environmental protection policies, however, companies were not required to restore the land back to its natural state (Wernick 2014).

The newer stringent channel cutting policies caused a decline and shift in how oil and gas companies extracted their product, resulting in the companies shifting to Deepwater extraction in The Gulf of Mexico (Schleifstein 2017). More stringent policies on canal digging resulted in less intensive construction methods, such as prop washing. Prop Washing occurs when tugboats use existing canals or shallow waters for access to well extraction. (Schleifstein 2017). The new industry standards set by the CWA, coupled with shifts in extraction methods helped to reduced

annual land loss rates between 1974-1990 from 42 square miles to 25 square miles, a 17 square mile difference annually (see Dunbar et al. 1992, Wernick 2014, Schleifstein 2017).

In the late 1980s, the Environmental Protection Agency determined that a long-term coastal restoration plan was needed to address the extensive land loss occurring in the MRD. However, a formal plan was not initiated until 1990, from 1990-1997 the Federal Coastal Wetlands Planning and Restoration Act (Breux Act, hereafter) allotted \$ 250 million to projects that prevent land loss (Louisiana Department of Natural Resources 1998). The Breux act was designed to identify and select the highest priority restoration projects and emphasized funding allocations which focused on the oversight of restoration funds (CWPPRA 2019). In total, the Breux Act funded and implemented 80 restoration projects by 1997 (CWPPRA 2019). The projects were picked based on cost-effectiveness, longevity, sustainability, risk and uncertainty, supporting partnerships, public support, and support for restoration plans (CWPPRA 2019).

The Breux Act was expected to prevent 13 percent of land loss, however, when combined with the two-freshwater diversion projects, land loss was to be reduced by 22 percent (Louisiana Department of Natural Resources 1998). The Caernarvon and Davis Pond Freshwater Diversions combined cost the State of Louisiana \$130 million (Louisiana Department of Natural Resources 1998.) Following the implementation of the Breux Act, and the Caernarvon and David Pond Freshwater Diversions, the State of Louisiana created and implemented the Coast 2050 Master Plan. The Coast 2050 Master Plan was created to sustain coastal ecosystems that protect and support the environment, economy, and culture of Southern Louisiana by allocating \$50 billion in funds by 2050 (Louisiana Department of Natural Resources 1998). The plan aimed to work with local, state/federal agencies, and researchers to create a plan based on the current state of coastal land loss knowledge. Additionally, prior to the Coast 2050 Master Plan, Coastal

Louisiana geographies had not been examined below a state scale, consequently, the Coast 2050 Master Plan divided Coastal Louisiana into 5 separate coastal zones. The 5 zones are depicted below In Figure 1-3 (Louisiana Department of Natural Resources 1998).

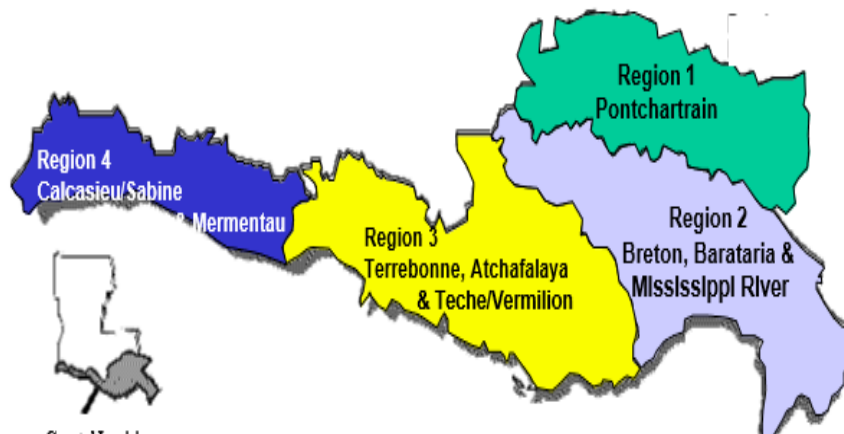


Figure 1-3 The Five Coastal Zones of The Coast 2050 Master Plan

Zone1 includes the Lake Pontchartrain Basin (Louisiana Department of Natural Resources 1998). Zone 2 consists of Breton Sound, Barataria Basin, and the Mississippi River Birdsfoot Delta (Louisiana Department of Natural Resources 1998). Zone 3 includes Terrebonne, Atchafalaya, and Teche-Vermilion Basin (Louisiana Department of Natural Resources. 1998). Zone 4 is comprised of Vermilion, Cameron, and Calcasieu Parishes. (Louisiana Department of Natural Resources 1998). Combined, Coastal Louisiana's extend 130 kilometers inland and 300 kilometers in width (USGS 2019).

1.2.2 Environmental Change Impacts

The impacts of environmental change in Coastal Louisiana are largely interconnected. As environmental change occurs and saltwater intrusion occurs, marshes shift from freshwater to saltwater, which results in significant habitat decline for aquatic species and waterfowl. Species

experiencing environment change include menhaden, redfish, brown and white shrimp, alligator, river otter, ringneck, wigeon, and gadwall (Anderson 2007, Nyman et al. 2013). If nothing is done to change the status quo, Coastal Louisiana will experience a habitat decline of 37 percent (Nyman et al. 2013). The sustainment of natural habitats is essential to the local populations in the regions, considering that the natural ecosystem is directly tied to livelihoods and cultures of local populations residing in Louisiana's coastal region (Anderson 2007). Due to habitat loss, hunters in the area are noticing a decline in waterfowl nesting locations, and a decrease in the number of waterfowl present in the region (Anderson 2007).

The decline in waterfowl habitats and presence has impacted the local culture as well. A century ago market hunting in Louisiana provided restaurants from New Orleans to New York with fresh duck from Cajun hunters (Anderson 2007). However, as duck populations in the region decline, the local population is focusing on saving the remaining species and ecosystems. According to Chad Courville, a ducks unlimited regional biologist, "the goal now is to save the best of what's left" (as quoted in Anderson 2007). Marsh decline in the region is increasing as freshwater from the river is no longer infused into the marsh allowing further saltwater intrusion to occur, which is resulting in a decline in the duck population, culture, and livelihoods of local populations (Anderson 2007). As quoted in Anderson (2007) Chad Courville states " duck calling, decoy carving, and mudboat building are not pastimes. They are lifestyles."

The loss of marshland in region has resulted in hunters being unable to return to the land that they have hunted in years prior. Now, local hunters are unable to show future generations the land they used to hunt on (Anderson 2007). Other communities are also experiencing hardships caused by environmental change. For example, fishing communities are experiencing environment change and expressing feelings of culture and heritage loss (Tibbetts 2006).

Humans in region are experiencing economic losses, changes in culture, and a loss of heritage, however, these are not the only impacts of environmental change that humans will have to address. As environmental change occurs, barrier islands will continue to disappear, which puts farther inland human settlements at an increased risk of experiencing infrastructure damages caused by hurricanes and storm surge. Examples of infrastructure damages include the flooding of roadways, ports being cut off from the rest of the parish, and damages to roadways and wastewater systems (Tibbetts 2006, Anderson 2007).

One example of the environment changes hardships that humans face is occurring at Isle De Jean Charles, Terrebonne Parish Louisiana. For example, the Biloxi-Chitimacha-Choctaw tribe that resides in Isle De Jean Charles is relocating away from their land in response to environmental change. In 1950, Isle De Jean Charles had a land area of 11 mi x 5 mi, currently the land area is only ¼ mi x 2 mi (Gallagher 2016). Scholars state that by 2050 the community of Isle De Jean Charles will have to be forcibly relocated if nothing is done to stop the land loss that is occurring. The tribe is voicing concerns that they are losing their heritage, history, and culture by moving from their land (Gallagher 2016, Maldonado et al. 2013).

1.2.3 The Mechanisms of Environmental Change

Environmental change in Coastal Louisiana is a complex problem caused by both non-anthropogenic, and anthropogenic actions. Some examples of non-anthropogenic mechanisms include wind driven pond erosion, regional sea level rise, eustatic sea level rise, global sea level rise, deltaic lobe abandonment, sediment introduction, sediment sinkage, hurricanes, and storm surge (see Costanza et al. 1990, Tibbetts 2006, Anderson 2007, Delaune et al. 2008, Morton et al. 2009, Couvillion et al. 2013, Nyman et al. 2013, Williams 2013, Rivard 2015, Gallagher 2016, Ortiz et al. 2017).

Although non-anthropogenic processes play a part in the forcing of environmental change, there are also multiple anthropogenic factors that further progress non-anthropogenic environmental change. Anthropogenic factors include oil and natural gas extraction, levee construction, urbanization, channelization of the Mississippi river, channel cutting and dredging for shipping and oil extraction, and climate change. (Anderson 2007, Burley 2007, Petrolia et al. 2011, Rivard 2015, Gallagher 2016, Gotham 2016). For example, channel cutting allows salt water to enter the marsh killing the local flora, resulting in further erosion. Once the land erodes, sea water rushes farther inland causing further saltwater intrusion and erosion, resulting in a negative feedback loop (Nyman et al. 2013). The feedback loop of saltwater intrusion and erosion is exacerbated by the channelization of the Mississippi River, which deprives the delta from receiving enough sediment to replenish the sediment that is eroding (Burley 2007, Marshall 2014).

1.2.4 Coastal Louisiana Environmental Change Policy

As stated above, in the late 1990's Louisiana created the Coast 2050 Master Plan to restore regions impacted by environmental change. The Coast 2050 Master Plan has been updated every five years, with the current working document titled the State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast (Master Plan hereafter). One of the key goals of the Master Plan is "implementing strategic measures to reduce and mitigate risk and to improve the sustainability of the coast. By doing so we improve the resilience of our economies, increase protection for Louisiana homes and businesses, improve health of our coastal ecosystems, and support the future of our unique cultures and communities (CPRA 2017, ES-8)."

The Master Plan allocates \$150 billion in 50 years for restoration and is expected to reduce annual damages of environmental change by \$8.3 billion (CPRA 2017). The 124 projects

of the Master plan are spread across 800 square miles, the plan provides \$18 billion to marsh creation using dredge material, and another \$5 billion to sediment diversions, \$2 billion for miscellaneous restoration, \$19 billion dollars are allotted for structural protection, and \$6 billion is allotted for nonstructural risk reduction (CPRA 2017). The plan also includes using flood risk and resiliency programs to proactively make communities more resilient to environmental change. The plan provides a recommendation of flood proofing 1,400 structures, elevating 22,400 structures, and acquiring 2,400 structures in at risk areas (CPRA 2017).

As a result, the plan estimates a reduction of risk by 75 percent for communities that include Houma, Slidell, Franklin, and Charenton, Edgard, Kenner, Metairie, Gaysville (CPRA 2017). Risk is also expected to be reduced by 90 percent for the communities of Ama, Laplace, Reserve, Hahnville, Luling, Montz, Donaldsonville, Convent, Vacherie, Lacrose, Golden Meadow, Morgan City, Abbeville, Delcambre, and Iberia (CPRA 2017). Additionally, the Master Plan is supportive and complimentary to the other plans such as the Mabus Report, The Gulf Coast Ecosystem Restoration Task Force's Regional Ecosystem Strategy, The Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (Restore Act), the Natural Resources Damage Assessment Programmatic Damage Assessment and Restoration Plan, and the National Fish and wildlife foundation.

The Master Plan also estimates positive impacts on the local flora and fauna, and the implementation of the Master Plan will improve habitats for Crawfish, Largemouth Bass, Alligators, Anchovy, Spotted Seatrout, Shrimp, Oyster, Mottled duck, and Green wing Teal. Protecting local flora and fauna benefits the human based populations and economies considering that the local flora and fauna are important to local cultures and customs. For

example, 75 percent of Louisiana's fin and shellfish industry depend on wetland ecosystems (Anderson 2007, CPRA 2017).

1.2.5 Adaptation

As climate change occurs, ecosystems and human settlement across the globe are experiencing the impacts of climate change, and in response academia and global agencies are researching ways to mitigate and adapt to climate change. Adaptation literature is commonly found within climate change and political ecology literature. Within climate change and political ecology literature, there are three common critiques about present adaptation studies. Firstly, in adaptation literature research focuses primarily on vulnerability, mitigation, adaptation processes, risk management, natural hazard responses (Klien et al. 2003, Ford et al. 2010, Bikrman 2011, Reser, and Swin 2011). However, there is gap within adaptation literature where scholars fail to analyze future impacts of environment degradation and climate change. Adaptation studies additionally fail to examine the complexity of environmental degradation and climate change (Klein et al. 2003, Ford et al. 2010, Bikrman 2011, Reser, and Swin 2011, Liverman 2015). Noticing these shortcomings, some scholars have made recommendations on how to further advance adaptation research.

Specifically, Fankhauser et al (1999) examines the elements of climate change strategy in the late 1990s and outlines anticipatory policies of climate change. The research argues that long term weather capital such as investments in design and infrastructure need to include a range that examines more than just current weather research, can be adjusted to understand variability in weather concerns. Specifically, investments in design need to be able to adjust to rapidly changing weather parameters (Fankhauser et al. 1999). Fankhauser et al (1999) identifies that more research is needed when examining how infrastructure and agriculture is impacted by the

anthropogenically enhanced greenhouse affect (Fankhauser et al. 1999). Furthermore, there is need to improve ability to adapt to climate change and reduce region regional climate change uncertainties, which Fankhauser et al (1999) argues can be conducted via the use of improved adaptation options, technology, and research.

Furthermore, long-term environmental planning in the future should include climate change projections (Fankhauser et al. 1999). Klein et al (2003) states that instead of concentrating on the long-term economic returns of adaptation, there should be a focus geared towards the assessment of an adaption projects economic value. Adaption research should include current and future projections rather than examining just the current climate change impacts when discussing funding incentives (Klein et al. 2003).

Finally, Liverman (2015) criticizes adaptation research by arguing that adaptation research focuses on observations and interviews with decision makers that fail to examine future climate issues, while emphasizing responding to current climate issues. Liverman (2015) argues that research in adaptation is geared towards mitigation rather than discussing adaptation, and instead should emphasize answering the hard questions of climate change. One example of the hard questions that Liverman (2015) would like answered is “who is eligible for adaptation assistance and who will pay for it?” Liverman (2015) continues to discuss that within adaptation literature there has been little work with governance, and the social impacts of geoengineer climate change solutions.

The second theme present in adaptation literature examines the lack of analysis examining politics and political systems impacts on adaptation. Basset and Fogelman (2012) state that within adaption literature there is too much repetition, and that politics as a topic within adaptation research is limited. Basset and Fogelman (2012) argue that adaptation research has

been limited to stimulus response models which narrows the parameter of adaptation thinking. Furthermore, considering that adaptation policy reformist suggest that reordering society is necessary to reduce vulnerability, a question of whom does the reordering needs answered (Basset and Fogelman 2012). In response, Basset and Fogelman (2012) suggest that Political Ecologist should study transformative adaptation through the lens of vulnerability and risk reduction.

The third theme in adaptation literature examines what adaptation is and its differences to mitigation. Adaptation to climate is the adaptive response to stimuli, climate adaptation can be in response to both extremes on an annual basis and change in long term conditions (Smit et al. 2000). Scholars have also defined the potential adaptation choices available to a community impacted by environmental degradation and or climate change. Warner et al (2010, 690) states that a community faced with natural hazards have three adaptation choices that include “(1) stay and adapt to mitigate the effects; (2) stay, do nothing and accept a lower quality of life; or (3) leave the affected area.”

Although Warner et al (2010) provides a framework for adaptation choices, the framework falls short by oversimplifying the ways in which a community can adapt and mitigate natural hazards. Warner et al (2010)’s framework fails to provide any examples of what ways a community can mitigate the effects of natural hazards, and further does not examine how mitigation efforts may differ from other mitigation efforts. Consequently, I have created a framework that expands upon Warner et al (2010)’s framework, by creating six categories of possible adaptation choices that a community may implement.

1.3 Summary

Coastal Louisiana is a rapidly changing environment that is experiencing both anthropogenically and non-anthropogenically forced environmental change. Environment change is causing severe ecosystem decline across the region, threatening both humans and local species. Adaptation to coastal environmental change has become a challenge to both the state and local governments in Louisiana, and the State of Louisiana has responded by creating the State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast as a way to combat environment change. However, there is little discussion of local government environmental policy.

This study examines the alignment of varying adaptation strategies employed by local governance compared to the State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast. Academic studies within the region are often niche and only examine specific topics such as marsh collapse thresholds, and modeling coastal land scape (Costanza et al. 1990, Couvillion and Beck 2013). In conversation with adaptation scholars, I have chosen to analyze the alignment of adaptation strategies between the local and state scale, and I have developed six categories of possible adaptation strategies.

Using a multi-sited comparative case study analysis, I answer my research question of; *how do local adaptation strategies align with the State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast?* Answering my research question provides insight into local and state governance relationships, and community level adaption decision-making processes. This research provides policy makers at both the local and state scales more understanding, and context into differing scales of governance relationships, and community

responses to environmental change. Consequently, this study allows policy makers the potential to create more effective environmental policies in the future.

Chapter 2 - Methods

2.1 Introduction

To answer my research question of “*how do local adaptation strategies align with the State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast?*”; I chose to conduct a multi-sited comparative case study analysis. The multi-sited comparative case study analysis consists of examining three Coastal Louisiana parishes that include Lafourche Parish, Plaquemines Parish, and Terrebonne Parish. I am using a multi-sited comparative case study because case studies are effective at creating a concrete explanation to a social phenomenon that transcends multiple scales (Baxter 2010; Bartlett and Vavrus 2017). Furthermore, considering that this research study is idiographic and focuses on exploring the depth of environmental change governance in Coastal Louisiana, a comparative multi-sited case study analysis is the most effective methodology. Case studies are effective methodology to use when conducting idiographic research, because case studies examine a problem or specific case in detail, providing context about that specific case (Baxter 2010).

A case study is also appropriate for this study because I understand that my study is not representative of all environmental change cases occurring in Coastal Louisiana, which understanding that one case is not entirely representative of a problem is a common way case studies are viewed within idiographic research (Baxter 2010). Using a case study allows me to analyze and explain the relationships between local and state governance in the context of Coastal Louisiana environmental change adaptation. By focusing on a small sample size this study creates a more holistic and contextualized understanding of Coastal Louisiana environmental change (Baxter 2010).

2.2 Study Area

The summer before starting my master's degree, I took part in the McNair Scholars Fellowship Program. During my time in the McNair Scholar Program, I conducted a preliminary textual analysis to conceptualize the narrative of environmental change occurring in Coastal Louisiana. Following preliminary research, I chose to select Lafourche Parish, Plaquemines Parish, and Terrebonne Parish for this case study because each parish is experiencing environmental change, additionally, there is a variability chosen adaptation strategies between parishes.

For example, in Lafourche Parish, Port Fourchon is practicing sustainable development using sediment diversions to build land where land has previously disappeared (Wold 2015). In Plaquemines Parish, the parish has chosen to use river diversions such the one in White Ditch, La to restore the land that is subsiding away (U.S. Army Corp of Engineers 2013). In response to environment change, Terrebonne Parish is practicing the voluntary relocation of Native American communities residing on Isle De Jean Charles (Gallagher 2016). Below in Figure 2-1 is a map visualizing the chosen study sites. As of 2010 Census Lafourche Parish, Terrebonne Parish, and Plaquemines Parish have a combined land area of 3,079.94 square miles, and a combined population of 231,546 (Census Bureau 2019).



Figure 2-1 Selected Study Sites, Lafourche Parish, Plaquemines Parish, and Terrebonne Parish.

2.3 Framework

To compare adaptation strategies implemented by state and local governments, I characterized categories of possible community responses to environmental change. I created categories of adaptation by adapting the work of Warner et al (2010). Warner et al (2010)'s work resides in a conversation of climate change adaptation literature. Adaptation research, as discussed in the literature review, focuses on defining the term adaptation, and examining where gaps in adaption research exist while providing future research recommendations. Liverman (2015) finds that studies of communities and agriculture focus on responding to current climate change issues, rather than addressing future climate change impacts and the complexity of climate change.

Warner et al (2010) responds to the gaps in the climate change and adaptation literature, by defining the possible adaption responses communities have, rather than adding new definitions of climate change adaptation. Warner et al (2010) states that when facing severe environment degradation, a community may choose from one of three adaptation categories. The three categories of possible adaptation choices prescribed by Warner et al (2010) include “Stay and adapt to mitigate the effects, “Stay, do nothing and accept a lower quality of life.”, “Leave the affected area.”

Although Warner et al (2010) provides a categorization of adaptation strategies, Warner et al (2010) falls short by not specifically identifying possible ways communities may mitigate the impacts of environmental change. In response to Warner et al (2010), I adapted Warner et al (2010)’s framework by creating my own framework that consist of six different adaptation strategy categories. The categories are based off the variability of adaptation strategies employed by parishes found during preliminary research. The adaptation framework I created is shown below in Table 2-1.

Code	Adaptation Strategy Choice	Definition
1	Do Nothing	The active and passive decision where no attempt in adapting to environmental change is made.
2	Change the Environment	The active decision to change the physical environment in order mitigate the symptoms of environmental change, as well as addressing issues caused by environmental change. Some examples include but are not limited to river diversions, using dredge material, changing the chemical compound of the water, raising roads etc.
3	Change the Communities Relationship to The Environment	An active decision to change a communities physical, social, and cultural relationships to the environment. Some examples include changing forms of employment, shifting cultural practices, changing predominate industries.
4	Relocate the Community	The active voluntary decision to relocate a community out of a region affected by environmental change to a region not affected by environmental change.
5	Adaptation Capacity Building	The active decision to pursue community education about local environmental change to increase adaptive capacity.

6	Other	Adaptation strategies that do not align with other categories of adaptation. Example include cultural protection through social systems, structural protection that has limited environmental impacts, and policy implementation.
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Table 2-1 Categories of Adaptation Framework (Note: There may be overlap of adaptation strategies between Change the Environment, Change the Communities Relationship to The Environment, and Relocation)

Above in Table 2-1 I prescribe a total of six possible responses a community has when responding to environment change. Communities in response to environment change can choose to “Do Nothing, Change the Environment, Change the Communities Relationship to the Environment, Relocate the Community, practicing Adaptation Capacity Building, and Other. To views the definitions of the six categories of adaptation see Table 2-1

2.4 Document Analysis

Once I created the categories of adaptation as shown above in Table 2-1, I conducted a document analysis of the Lafourche Parish 2013 Comprehensive Resiliency Plan, Plaquemines Parish Comprehensive Master Plan, The State of Louisiana’s 2017 Comprehensive Master Plan for a Sustainable Coast, Terrebonne Parish’s Coastal Restoration 2009 plan. I chose to use a document analysis based off the methods specified by Given (2008). One of many methodologies utilized in a document analysis is, a content analysis which is used to determine the differing themes and patterns in a text through categorization (Given 2008). Using the six categories of adaptation, I inductively coded the adaptation strategies for each parish and the State of Louisiana to determine common trends of adaptation. Using Microsoft Excel spread sheets, I coded the local parishes and State of Louisiana documents using my framework of

adaptation to categorize adaptation strategies. I analyzed the documents I collected by reading through each document multiple times, searching for adaptation strategies employed by the parishes and the State of Louisiana. Then using excel, I applied a code of adaptation from my framework to the adaptation strategies found in the documents. Shown below in Figure 2-2 is an example of the way I analyzed and coded the local parish and State of Louisiana documents.

Document Title	Governance Scale	Region	Adaptation strategy	Number of Projects	Adaptation Category	Adaptation Code	Align with Master Plan
Coast Master Plan	State of Louisiana	South West Coast	Hydrologic Restoration	1	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South West Coast	Marsh Creation	3	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South West Coast	Sediment Diversion	2	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South West Coast	Shoreline Protection	4	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South West Coast	Nonstructural Risk Reduction	9	Change the Environment/ Relocation 2 and 4	Y	
Coast Master Plan	State of Louisiana	South West Coast	Structural Protection	3	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South West Coast	Marsh Creation	11	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South West Coast	Nonstructural Risk Reduction	3	Change the Environment/ Relocation 2 and 4	Y	
Coast Master Plan	State of Louisiana	South West Coast	Structural Protection	3	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South West Coast	Marsh Creation	6	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South West Coast	Ridge Restoration	2	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	Central Coast	Hydrologic Restoration	1	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	Central Coast	Marsh Creation	1	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	Central Coast	Ridge Restoration	2	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	Central Coast	Sediment Diversion	1	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	Central Coast	Nonstructural Risk Reduction	2	Change the Environment/ Relocation 2 and 4	Y	
Coast Master Plan	State of Louisiana	Central Coast	Structural Protection	1	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	Central Coast	Hydrologic Restoration	1	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	Central Coast	Marsh Creation	4	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	Central Coast	Ridge Restoration	2	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	Central Coast	Shoreline Protection	1	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South East Coast	Hydrologic Restoration	1	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South East Coast	Marsh Creation	3	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South East Coast	Ridge Restoration	5	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South East Coast	Sediment Diversion	7	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South East Coast	Shoreline Protection	6	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South East Coast	Nonstructural Risk Reduction	16	Change the Environment/ Relocation 2 and 4	Y	
Coast Master Plan	State of Louisiana	South East Coast	Structural Protection	5	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South East Coast	Marsh Creation	10	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South East Coast	Ridge Restoration	3	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South East Coast	Sediment Diversion	1	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South East Coast	Shoreline Protection	1	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South East Coast	Nonstructural Risk Reduction	2	Change the Environment/ Relocation 2 and 4	Y	
Coast Master Plan	State of Louisiana	South East Coast	Structural Protection	1	Change the Environment	2 Y	
Coast Master Plan	State of Louisiana	South East Coast	Marsh Creation	3	Change the Environment	2 Y	

Figure 2-2 Document Analysis Coding (An example of the way the parish and state documents are coded according to adaptation strategy within Microsoft Excel).

Below in Table 2-2 is the documents used in my document analysis according the scale of governance going from the top down, starting with the highest scale of governance.

Governance Scale	Document Name	Document Publication Date
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CPRA	The State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast	2017
Lafourche Parish	Lafourche Parish RESTORE ACT Multiyear Implementation Plan	2015
Lafourche Parish	Hazard Mitigation Update	2015
Plaquemines Parish	Plaquemines Parish Comprehensive Master Plan	2009
Plaquemines Parish	RESTORE ACT Direct Component; Multiyear Implementation Narrative	2015
Terrebonne Parish	Coastal Restoration Comprehensive Plan	2009

Table 2-2 Document Analysis Data (A list of the documents examined within the research study).

2.5 Key Actor Interviews

I conducted fieldwork in Coastal Louisiana from September 14th - September 21st 2019. Conducting fieldwork allowed me to access documents that would otherwise be inaccessible to me, considering that I do not live close to my study sites. During fieldwork, I utilized the Semi-Structured Interview methodology. Semi-Structured Interviews are interviews that are structured but allow for some flexibility in the interviewing process, unlike a Structured Interview that allows for little deviation from the interview. For example, during Structure Interviews interviewees are asked the exact same question in the same order (Dunn 2010). The flexibility of a Semi-Structured Interview allows the key actor to dictate the tempo of the interview (Dunn 2010). Additionally, using the Semi-Structured Interview methodology provides the key actor

with more flexibility to discuss perceptions, life events, and oral histories (Dunn 2010). Semi-Structured Interviews are also useful when interviews can only be conducted one time with a participant (Bernard 1998).

When selecting samples for key actor interviews, I chose to utilize Non-Probability Sampling (NPS hereafter). NPS is a method where the researcher specifically chooses the sample they want to examine (Naderifar M et al. 2017). I chose to use NPS considering our research does not aim to generalize about a larger population (Naderifar M et al. 2017). Additionally, NPS allows me to corroborate established literature, determine key actor's perceptions, and reconstruct events (Tansey 2007). However, when using NPS there is a chance that the validity of the research design is negated by selection bias (Naderifar M et al. 2017). I attempted to limit selection bias by selecting key actors based on their position in the context of Coastal Louisiana environmental change.

Key actors in this study include elected officials and government employees, such as parish representatives, parish presidents, government agency officials, and appointed officials that are appointed by elected officials. Elected officials and government employees are an effective sample for this study, because these key actors have direct influence over adaptation policy at the parish scale. For example, government elected officials, and government employees impact adaptation through the allocation of funds and choosing which adaptation strategies are employed. Furthermore, elected officials and government employees are influenced by the local electorate and industries, thus influencing adaptation policy based on local wants and desires. Using key actor interviews provided me with the ability to understand the context of the documents I examined in the document analysis. Furthermore, key actor interviews allow me to gain access to information local officials deem important.

Prior to fieldwork, I called 37 potential interviewees attempting to schedule interviews, emailing each potential sample 3 times, and calling each sample 3 times, and when calling the sample I left a voicemail. Additionally, I waited two weeks between communications to allow for adequate response times. In total, only 5 interviewees agreed to be interviewed during fieldwork. Following fieldwork, I conducted phone interviews with 3 more interviewees. Below In Table 2-3 is the guiding questions I am using for the Semi-Structured Interviews. In Appendix A - is the informed consent that was included in an Institution Review Board application, following the completion of Kansas State Universities Institutional Review Board training courses. Additionally, see Figure B-1 for my IRB approval letter from Kansas State University, the is listed as IRB 9841.

Structure	Questions
Introduction	<ol style="list-style-type: none"> 1. Explanation of research project and consent to interviews. 2. How has environmental change impacted the parish and local communities? 3. What in the parish and local communities is threatened by environmental?
Adaptation Strategies (Decision Making)	<ol style="list-style-type: none"> 1. What factors determine if an adaptation strategy is chosen or not? 2. What role does industry and commerce play on the choosing and implementation of an adaptation strategy? 3. What role does politics play on the choosing and implementation of an adaptation strategy? 4. What role does religion and culture play on the choosing and implementation of an adaptation strategy? 5. Who determines what adaptation strategies are chosen? 6. Who chooses how an adaptation strategy is implemented?
Adaptation Strategies (Implementation)	<ol style="list-style-type: none"> 1. How is environmental change addressed by the local and state government? 2. How have parish and local communities in the parish addressed environmental change? 3. What else needs to be done to address environmental change?

Table 2-3 Semi Structured Interview Questions (Depiction of the guiding questions that asked during Semi-structured Interviews).

During fieldwork I also conducted ethnographic research in the form of participant observation, where I attended the September 2019 Coastal Protection and Restoration Authority Board Meeting. I attended this meeting to gain a contextualization of how local actors interacted with the State of Louisiana. Following my return to Kansas, I amended our IRB and added phone interviews, at which point I utilized the Snowball Sampling methodology to gain access to actors that were not available during fieldwork. Employing the Snowball Sampling methodology is effective because it allows a researcher to gain access to populations that are difficult to reach (Tansey 2007, Naderifar M et al. 2017). Using Snowball Sampling, I gained access to 4 officials who I did not contact prior fieldwork. In total 12 interviews were conducted during this study; However, 4 interviews were excluded from the study considering the positions held by the government officials do not align with the scope of this study. Excluding four interviews from this study, leaves the study with a total sample size of 8. Below in Table 2-4 is a breakdown of what scale of governance each interviewee was from. I interviewed 2 officials from Lafourche Parish, 2 officials from Plaquemines Parish, 3 officials from Terrebonne Parish, and 1 official from the CPRA.

Governance Scale	No. of interviews
Terrebonne Parish	3
Lafourche Parish	1
Lafourche Parish	1*
Plaquemines Parish	1
Plaquemines Parish	1*
State CPRA official	1*
Total	

Table 2-4 Key Actor Interviews Sample Size (Depicts the interviewees position and the amount of interviews conduct during fieldwork and after, (*) means the interview was conducted post fieldwork).

2.6 Analysis

To analyze the key actor interviews that I conducted, I chose to utilize the qualitative management software ATLAS ti 8 to identify common trends and themes present in the interview transcripts. I created categories of coding based off my interview questions to inductively code the interviews. These categories include Impacts, Threats, Factors, Industry/Commerce, Politics, Religion/Culture, Actors, Decision, Disconnect, Education, Funding, and Future (what should be done). Using the codes I created from my interview questions, I read through each interview transcript and assigned codes based on what themes appeared. An example of how I coded the key actor interview transcripts is shown below in Figure 2-3.

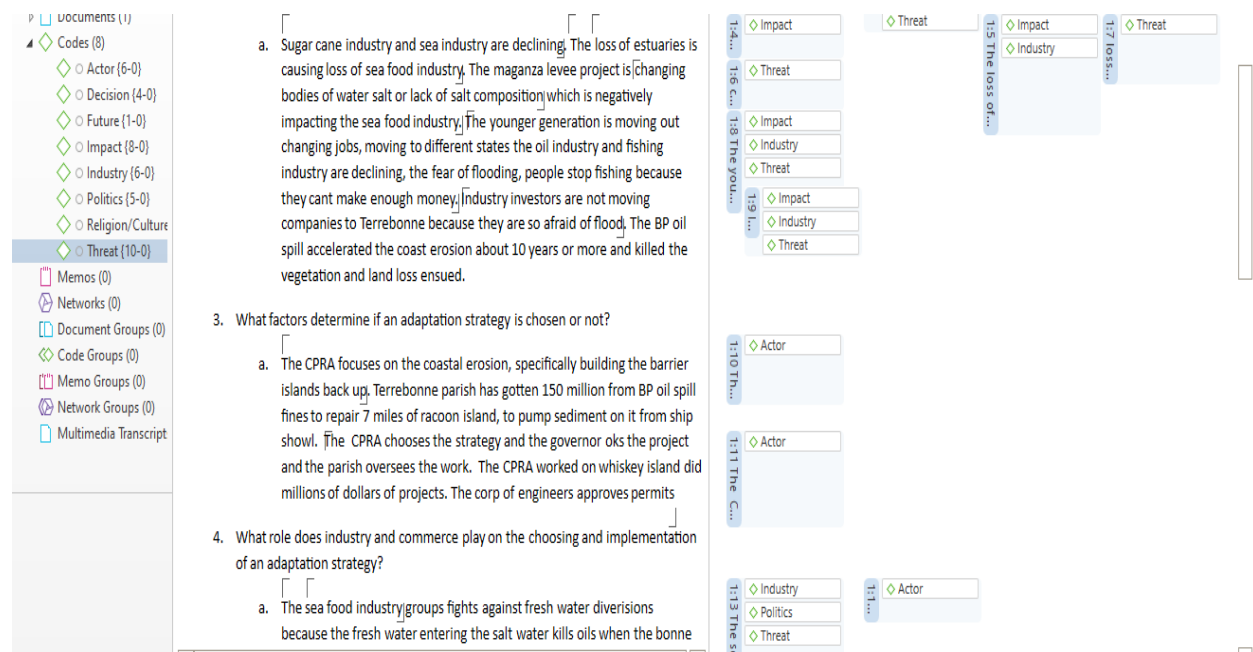


Figure 2-3 Interview Coding Example (Depiction of the codes created and how the coding analyses were conducted).

2.6 Limitations of the study

This study is not without limitations, and there are at least four. First, due to the research being formed around a master's degree time schedule and limited funding, there was limited time available for field research to be conducted. The lack of time also limited the number of parishes that could be examined in a multi-sited comparative case study analysis. Furthermore, the lack of time for fieldwork made it difficult to access documents that may have not been digitized, as a result, there is a chance that research saturation was not achieved.

Second, although the parish documents are within 10 years of the current year 2019-2020, the parish websites where documents are found use normal search engines such as Google and Bing. As a result, finding parish master plans and or coastal adaptation documents proved difficult, and opens the possibility the study did not examine the most up to date documents. Thirdly, the use of NPS presents an opportunity for selection bias to be present within this research study (Naderifar M et al. 2017). However, as stated above I have attempted to negate selection bias by selecting participants based on their position as elected officials or government employees, rather than sex, gender, age, race, and ethnicity. Finally, the use of NPS also allows participation bias to be present within this study.

The four limitations listed above could be rectified in a similar future study, by spending more time conducting fieldwork or using multiple fieldwork trips. Having more time to conduct fieldwork, or multiple fieldwork trips would be effective at increasing the N and gaining access to officials that were not able to be contacted prior to fieldwork. Also, multiple fieldwork trips and more time during fieldwork would allow me a chance to access documents that are not digitized and thus providing more textual data. Finally, more time would allow for more

interviews to be potentially conducted, as a result, a larger N would decrease the impacts of participation bias providing a more holistic analysis.

Chapter 3 - Results

3.1 Introduction

This chapter includes the document analysis results, the results of the key actor interviews, and is broken up into 4 sections. The first section displays the results of the State of Louisiana's document analysis. The second section depicts local parish document analysis results, and the third section examines the results of the key actor interviews. Finally, the fourth section discusses the perceived environmental change threats and impacts that are discussed by key actors. The documents analyzed in this study are displayed in Table 2-2.

3.2 Results of State Governance Environmental Change Policy Analysis

I analyzed the State of Louisiana's 2017 Comprehensive Master Plan for Sustainable Coast, this document is important because it describes the State of Louisiana's perceived threats and impacts of environmental change and chosen adaptation strategies. First, I examined the State of Louisiana's perceived threats and impacts of environmental change. The Master Plan specifies that the region is experiencing land loss at a rapid rate, and that the land loss is influenced by multiple mechanisms. The mechanisms of land loss include hurricanes, climate change, sea level rise, storm surge, human impacts, and the disconnection of the Mississippi River from the marshes (CPRA 2017). The impacts of land loss include further land loss, flooding, marsh decline, storm surge, and swamp decline (CPRA 2017). The threats, impacts, and mechanisms of land loss are also identified by the State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast are depicted below in Table 3-1. The Master Plan identifies that in Coastal Louisiana the overarching problem is land loss, rather than examining the threats

and impacts of land loss in a broader more complex and interconnect theme of environmental change.

Governance Scale	CPRA
Threats	<ul style="list-style-type: none"> • Land loss
Impacts	<ul style="list-style-type: none"> • Land loss • Flooding • Marsh decline • Storm Surge • Swamp decline
Mechanisms of land loss	<ul style="list-style-type: none"> • Hurricanes • Climate change • Sea level rise • Subsidence • Storm Surge • Disconnect of the Mississippi River from marshes • Human impacts

Table 3-1 The State of Louisiana’s 2017 Comprehensive Master Plan for a Sustainable Coast Perceived Land Loss Threats, Impacts, and Mechanisms.

I also identified what adaptation categories are prescribed by the Master Plan, and attributed the adaptation strategies codes of adaptation from my framework found in Table 2-1. Table 3-2 depicts how the State of Louisiana has responded to environmental change using the State of Louisiana 2017 Comprehensive Master Plan for a Sustainable Coast. Specifically, in Table 3-2 the State of Louisiana has chosen to responded to land loss by employing Change the

Environment as the preferred response. To view adaptation category definitions reference Table 2-1.

Environmental Change Project Type	No. of projects	Adaptation Category	Description
Hydrologic Restoration	4	2	Conveys fresh water to areas that have been cut off by man-made features or prevents the intrusion of saltwater into freshwater areas through man-made channels and eroded wetlands.
Marsh Creation	35	2	Establishes new wetlands in open water areas such as bays, ponds, and canals through sediment dredging and placement.
Sediment Diversions	11	2	Use channels and/or structures to divert sediment and freshwater
Shoreline Protection	12	2	Provided by near-shore breakwaters reduces wave energies on shorelines surrounding open bays, lakes, sounds, and bayous.
Non-Structural Risk Reduction	39	2 and 4	Projects elevate and floodproof buildings and help property owners prepare for flooding or move out of areas of high risk.
Structural Protection	13	2	Projects reduce flood risk by acting as physical barriers against storm surge. These systems can include earthen levees, floodwalls, floodgates, and pumping stations
Ridge Restoration	12	2	Uses dredging, sediment placement, and vegetative plantings to restore natural ridge functions in basins.

Table 3-2 The State of Louisiana's Categories of Adaptation (Depicts the types of projects implemented at the state scale and the codes I assigned to the project types).

A total of 6 out of 7 projects fall into the adaptation category Change the Environment.

Change the Environment is defined as the active decision to change the physical environment in order mitigate the negative impacts of environmental change, as well as addressing issues caused by environmental change. Some examples include, but are not limited to, building river diversions, using dredge material to build land where land has been previously lost, changing the

chemical compound of the water through freshwater introduction, raising roads etc. The only project to utilize two categories of adaptation is Non-Structural Risk Reduction, which includes Change the Environment and Relocate the Community. Relocate the Community is defined as the active voluntary decision to relocate a community out of a region affected by environmental change to a region not affected by environmental change.

Non-Structural Risk Reduction is defined by the Master Plan as floodproofing/elevating structures, and property acquisition (CPRA 2017). Specifically, “Non-structural mitigation projects include non-residential floodproofing where 100-year flood depths are 1 to 3 feet, residential elevation where 100-year flood depths are 3 to 14 feet, and residential voluntary acquisition where 100-year flood depths are greater than 14 feet (CPRA 2017).” Non-Structural Risk Reduction plans to “flood proofing more than 1,400 structures, elevating more than 22,400 structures, and the acquisition of approximately 2,400 structures in areas that are most at risk (CPRA 2017).” Non-Structural Risk Reduction practices implicit relocation using voluntary property acquisitions. Consequently, aside from the limited practice of implicit relocation, the preferred category of adaptation by the State of Louisiana is to Change the Environment. An example of Non-Structural Risk Reduction is shown below in Figure 3-1, which depicts a residence that has been elevated in response to environmental change impacts such as flooding,

and storm surge.



Figure 3-1 An Example of Non-Structural Risk Reduction: (A residence that has been raised in Southern Terrebonne Parish).

3.3 Results of Local Governance Environmental Change Policy Analysis

Below in Table 3-3, Table 3-4, Table 3-5 are summaries of the adaptation strategies employed by Lafourche Parish, Plaquemines Parish, and Terrebonne Parish according to the government documents I collected and analyzed. The documents used in this study are shown in Table 2-2. The adaptation codes that I attributed to parish adaptation strategies using my framework are displayed in Table 2-1. As a note, Plaquemines, and Terrebonne parishes did not provide descriptions for adaptation strategies, while Lafourche Parish did provide descriptions. However, during the interviews, officials did clarify what some of the not commonly used adaptation strategies are.

3.3.1 Lafourche Parish Document Analysis Results

The Lafourche Parish documents that I analyzed are discussed in Table 2-2, the documents identify that the parish is threatened by land loss, salt water intrusion, flooding, subsidence, and marsh collapse. In response to the environmental change occurring in the parish, Lafourche Parish is employing adaptation strategies to combat environment change. Lafourche Parish is utilizing Change the Environment as the preferred adaptation used in response to environmental change, however, unlike the State of Louisiana there is more variability of adaptation strategies within Lafourche Parish. The variability of adaptation strategies employed in Lafourche Parish are depicted below in Table 3-3, where 4 out of 7 adaptation strategies are categorized as Change the Environment. There are 2 instances of the Other category being employed in Lafourche Parish, and 1 instance of Adaptation Capacity Building.

Environmental Change Project Type	Number of Projects	Adaptation Category	Description
Drinking Water Protection	4	6	Locate and construct additional potable water intakes further north in the parish to provide drinking water during a saltwater intrusion event.
Land Loss Monitoring	3	6	Ensure accurate survey points are located throughout the parish to monitor continued subsidence.
Mitigation Education and Outreach	4	5	Monitor agricultural activities and encourage smart farming practices to reduce soil compaction and acceleration of subsidence; Establish a public outreach campaign to ensure all homeowners in floodplains are aware of the various types of coverage options under the NFIP; Establish a

			homeowner education program on flood mitigation measures; Provide educational brochures to libraries, schools, and other public facilities including mitigation measures for all hazards.
Parish Capital Outlay Projects	3	2	Completion of Capital Outlay projects, including additional drainage improvements, infrastructure and building upgrades and improvements, pump station improvements, bulkhead improvements, and other unidentified capital outlay projects.
Marsh Creation	4	2	No description given.
Ridge Restoration	1	2	No description given.
Freshwater Reintroduction	1	2	No description given.

Table 3-3 Lafourche Parish Categories of Adaptation (Note: descriptions come from Lafourche Parish Hazard Mitigation Update 2015).

3.3.2 Plaquemines Parish Document Analysis Results

According to the Plaquemines Parish documents discussed in Table 2-2, Plaquemines Parish is experiencing significant environmental change. Specifically, the parish is experiencing land loss, saltwater intrusion, barrier island decline, shoreline erosion, marsh decline, subsidence, flooding, and storm surge. In response to environmental change Plaquemines Parish has employed multiple adaptation strategies. Mimicking the State of Louisiana, Plaquemines Parish overwhelmingly employs Change the Environment as the preferred adaptation strategies used in response environmental change as shown below in Table 3-4. In Plaquemines Parish 7 of the 8 adaptation strategies employed are categorized as Change the Environment and 1 adaptation strategy is categorized as Adaptation Capacity Building.

Environmental Change Project Type	Number of Projects	Adaptation Category
Structural Protection (Flood gates, Drop log tunnels, Tunnel enhancement,	41	2

Repairing structures, Levee lift and enhancement, flood wall replacement, highway lift and strengthening, pumping modifications and fronting protections,		
Freshwater Diversion	2	2
Outfall Management	3	2
Diversions	2	2
Shoreline Restoration	1	2
Marsh Creation	3	2
Barrier Island Restoration	1	2
Public Outreach and Engagement	1	5

Table 3-4 Plaquemines Parish Categories of Adaptation (Note: Many of the structural protection measures were discussed in a niche capacity, as a result, I combined measures to create the type of adaptation strategy (Structural Protection).

3.3.3 Terrebonne Parish Document Analysis Results

Terrebonne Parish is experiencing large scale environmental change that is caused by multiple factors. As discussed in parish documents found in Table 2-2 the parish is impacted by land loss, salt water intrusion, marsh decline, storm surge, flooding, barrier island and shoreline decline, and a lack of sediment induction into the marshes. In response to environmental change, the parish employs a singular theme of adaptation. Similar to the State of Louisiana, Terrebonne Parish uses Change the Environment as the preferred response to environmental change. Below in Table 3-5 is a visual depiction of the variety of projects employed within Change the Environment, additionally, Change the Environment is the only adaptation strategy that Terrebonne Parish chooses to use. Shoreline protection as discussed in Table 3-5 is shown below in Figure 3-2 that depicts rocks placed along the banks of marsh to slow erosion.

Environmental Change Project Type	Number of Projects	Adaptation Category
Barrier Island Restoration	6	2
Marsh Creation	11	2
Ridge Restoration	1	2

Dredging	8	2
Rock (Break Waters)	1	2
Freshwater Induction	11	2
Freshwater Enhancement	2	2
Freshwater Diversion	2	2
Sediment Pipeline	1	2
Shoreline Protection	1	2
Barrier Island Vegetation Restoration	1	2

Table 3-5 Terrebonne Parish Categories of Adaptation.



Figure 3-2 Shoreline Protection (Rocks placed along the shoreline to slow erosion).

Within Lafourche Parish, Plaquemines Parish, and Terrebonne Parish there are a total of 26 varying adaptation strategies. I categorized a total of 22 adaptation strategies as adaptation category (2) Change the Environment. However, although many of the adaptation strategies fall into adaptation category (2), there are patterns of variability between parishes. Additionally, most of the adaptation variability occurs in Lafourche Parish. Lafourche Parish not only practices Change the Environment, but also adaptation categories (5) Adaptive Capacity Building, and category (6) Other. Adaptive Capacity Building is defined as the active decision to pursue community education about local environmental change to increase adaptive capacity. ‘Other’ is defined as adaptation strategies that do not fit within the pre-defined categories of adaptation. Examples include cultural protection through social systems. Examples of cultural protection through social systems include choosing to relocate cemeteries, using business incubators to determine what businesses are sustainable, and using oil company environmental lawsuit funds for adaptation. Cultural protection through social systems is not limited to those three examples.

Structural protection that has limited environmental impacts is also part of the other category, examples of structural protection with limited environmental impacts include the repair of levees, flood gates, pumps, and elevated structures. The examples listed for structural protection that has limited environmental impacts are not the only options allowed in the category.

Finally, policy implementation also fits in the ‘Other’ adaptation category. Some examples of policy implementation include the use of taxation to fund environmental change, implementing environmental policies, using funding sources, and creating new policies to address environmental change. The examples given are not the sole examples of policy implementation. Plaquemines Parish exhibits limited variability of adaptation categories and

primarily practices Change the Environment, and in one occurrence practices Other as adaptation strategies. While Terrebonne Parish documents emphasize practicing Change the Environment as a response to environmental change.

In summary, the State of Louisiana prefers to use Change the Environment when responding to impacts of environmental change. Similarly, at the local scale, the most frequent category of adaptation is Change the Environment, additionally, unlike state governance there is more variability in adaptation strategies at the local scale. However, the variability in adaptation strategies is skewed primarily to Lafourche Parish. As a result, the 22 out of 26 adaptation strategies utilized at the local and state scale fall under Change the Environment. There is also a limited variability of environmental change threats between State of Louisiana and Lafourche Parish, Plaquemines Parish, and Terrebonne Parish. The limited variability of threats likely results in the limited variability of adaptation, and the use of Change the Environment both at the state and the local scale suggest that local environmental governance is aligned to the State of Louisiana in terms of response to environmental change.

3.4- Results of Local Governance Key Actor Interview Analysis

In this section I discuss the results of the multi-sited key actor interviews. Key actor interviews are discussed in the Chapter 2 section 5. I analyzed key actor interviews by extracting the adaptation strategies employed by local parishes, and prescribed codes of adaptation from my framework found in Table 2-1.

3.4.1 Lafourche Parish Key Actor Interview Results

Below in Table 3-6, is the environmental change adaptation strategies employed by Lafourche Parish according to key actors. Similar to the document analysis, key actor interview results depict a limited amount of variability when discussing the threats of environmental change as shown in Table 3-9. However, unlike the document analysis results, key actors discuss how the threats of environmental change are impacting Lafourche Parish. As show in Table 3-9, there is a wide of variety of environment change impacts present in Lafourche Parish. Some of the environmental change impacts include, but are not limited to, out of parish relocation, increased wave action, increased pressure on fire districts, saltwater intrusion, and loss of access to industrial sites.

Also like the document analysis of Lafourche Parish, and the State of Louisiana, Lafourche Parish employs Change the Environmental as the preferred adaptation strategy when responding to environmental change. A total of 7 out of 13 adaptation strategies are categorized as Change the Environment. However, unlike the document analysis results, Lafourche Parish exhibits significantly more variability in adaptation strategies. Specifically, 3 strategies are categorized as other, the following categories are Change the Communities Relationship to the Environment, Relocate the Community, and Adaptive Capacity Building are employed once. The variability of adaptation strategies discussed in the above section are displayed below in Table 3-6.

Environmental Change Adaptation Strategies	Adaptation Category
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Elevation of Highways	2
Terracing	2
Marsh Creation	2
Protection of Native American Burial Grounds	6
Freshwater Induction	2
Small Scale Terracing	2
Limited Property Buyouts	4
Removing Derelict Boats	6
Studying Adaptation Strategies for Resilience-Based Housing	5
Dredging of Sediment	2
Sediment Diversions	2
Sustainable Business Incubator	3
Institution of GOMESA	6

Table 3-6 Lafourche Parish Adaptation Categories.

3.4.2 Plaquemines Parish Key Actor Interview Results

Plaquemines Parish is experiencing significant environmental change across the parish. Examples of environmental change threats according to key actors include flooding, land loss, and saltwater intrusion. However, unlike the document analysis key actor interviews depict a significant amount of variability when discussing the impacts of environmental change. Some impacts of environment change present in Plaquemines Parish include, but are not limited to, population loss, saltwater intrusion, mental health decline, insurance rates increase, marsh decline, and an artificial sense of security from parish levees. The impacts and threats of environmental change in Plaquemines Parish can be found in Table 3-9.

In response to the threats and impacts of environmental change key actors discuss the Plaquemines Parish chosen adaptation strategies. Similar to the document analysis the preferred

adaptation strategies employed in Plaquemines Parish is Change the Environment. Additionally, Plaquemines Parish key actor interviews mirror the document analysis of Plaquemines Parish by depicting a limited amount of variability between chosen adaptation strategies. In total 5 out of 6 adaptation strategies are categorized as Change the Environment, 1 strategy is categorized as Relocate the Community. The chosen adaptation strategies the Plaquemines Parish employs is shown below in Table 3-7

Environmental Change Adaptation Strategies	Adaptation Category
Population Self Selecting to Leave	4
Freshwater Diversions	2
Sediment Diversions	2
Elevating Structures	2
Levees	2
Marsh Creation	2

Table 3-7 Plaquemines Parish Environmental Change Adaptation Strategies

3.4.3 Terrebonne Parish Key Actor Interview Results

Environment change is occurring across Terrebonne Parish, and according to key actors the parish is threatened by land loss, storm surge, saltwater intrusion, flooding, marsh loss, and barrier island loss. Additionally, the parish is impacted by environmental change in a variety of ways that include, but are not limited to, infrastructure loss, population relocation, loss of estuaries, and increased saltwater intrusion. The key actor's perception of the environmental threats and impacts are depicted in Table 3-9. In response Terrebonne Parish uses a variety of adaptation strategies when responding to the threats and impacts of environmental change, which is depicted below in Table 3-8. Table 3-8 depicts that Change the Environment is the preferred method of adaptation, Change the Environment accounts for 10 of the 14 adaptation strategies

employed by Terrebonne Parish, and Relocate the Community accounts for 2 of the adaptation strategies. While the categories of Change the Communities Relationship to the Environment adaptation, and Other are only expressed once. Unlike the document analysis of Terrebonne Parish, there is significantly more variability of employed adaptation strategies when discussing adaptation with key actors.

Environmental Change Adaptation Strategies	Adaptation Category
Marsh Creation	2
Barrier Islands Restoration	2
Levee Lift and Enhancements	2
Elevation of Homes	2
Sediment Dumping	2
Industry Investment	3
Freshwater Diversions	2
Sand Dredging	2
Barrier Island Reconstruction	2
Self-Taxation of Parish	6
Flood Gates	2
Morganza to the Gulf Levee	2
Population Internal Migration	4
Population Relocation	4

Table 3-8 Terrebonne Parish Environmental Change Adaptation Categories

3.5 Key Actor Perceived Threats and Impacts of Environmental Change.

Below in Table 3-9 is a depiction of the perceived threats and impacts of environmental change as discussed in key actor interviews. Although there is some variability, there is limited discussion on why the threats and impacts vary across government jurisdictions. As a result, this section only details what the local parishes are responding to when employing adaptation. When examining the threats of environment change there is limited variability between parishes. However, when actors discuss the impacts of the environmental change, there is significant variability between parishes. As a result, the variability present in adaptation strategies is likely in response to the variability of environmental change impacts.

Parishes	Lafourche	Plaquemines	Terrebonne
Threats	<ul style="list-style-type: none"> • Flooding • Land Loss • Saltwater Intrusion 	<ul style="list-style-type: none"> • Storm surge • Land loss • Saltwater intrusion • Barrier island loss • Marsh and swamp loss 	<ul style="list-style-type: none"> • Storm Surge • Saltwater Intrusion • Land Loss • Flooding • Marsh Loss • Barrier Island Loss
Impacts	Population Loss, Relocation, Marsh Loss, Swamp Loss, Barrier Island Loss, Insurance Rate Increase, Uninsurable due to Flooding, Artificial Sense of Security from Levees, Mental Health Decline, Industry Decline, Industry Shifts in Populace, Increased Storm Surge, Increased Saltwater Intrusion, Changes in Habitat, Fishing Industry Decline	Flooding, Land Change to Open Water, Internal Parish Relocation, Out of Parish Relocation, Loss of Local Revenue, Increasing Insurance Rates, Population Decline, Increased Wave Action, Increased Pressure on Fire Districts, Loss of Estuaries, Increased Saltwater Intrusion, Loss of Access to Industrial Sites, Private Citizen Boats Abandoned in Canals due to Industry Change	Infrastructure Loss, Barrier Island Loss, Internal Population Relocation, Loss of Estuaries Population Relocates Out of the State, Increased Storm Surge, Increased Saltwater Intrusion

Table 3-9 Key Actor Perceived Threats and Impacts (A depiction of what key actors perceive to be the impacts and threats of environmental change)

3.6 Summary

In summary, using both the document analysis and key actor interviews, there is a total of 59 varying adaptation strategies, and a total of 45 adaptation strategies are categorized as Change the Environment. There are 14 other adaptation strategies that align with other categories depicting a degree of variability across parishes, 8 out of the 14 strategies not characterized as Change the Environment are practiced in Lafourche Parish. The 4 out of 14 strategies not characterized as Change the Environment are employed by Terrebonne Parish, and only 2 categories outside of Change the Environment are discussed in Plaquemines Parish. When

examining the document analysis there a total of 33 adaptation strategies, with 28 adaptation strategies categorized as Change the environment. At state scale 1 out of the 5 categorizes not characterized as Change the Environment is overlapped with Change the environment. The other 4 categories that do not align with Change the Environment at split with 4 in Lafourche Parish, and 1 in Plaquemines Parish. Consequently, there is more variability of adaptation present in parish documents than the State of Louisiana document.

However, when analyzing key actor interviews there is more variability of adaptation, with 22 of the total 33 adaptation strategies characterized as Change the Environment, while 9 categories across parishes are not categorized as Change the Environment, with 5 in Lafourche Parish, 1 in Plaquemines Parish, and 4 in Terrebonne Parish. According to the documents analysis results there appears to be alignment between local parishes and the State of Louisiana when examining chosen adaptation strategies. However, when examining key actor interviews, there is an increase of variability between parishes and the State of Louisiana regarding chosen adaptation strategies. The increase in variability displays a lack of alignment between parish environmental documents, and the viewpoints of parish officials. Below in Table 3-10 is a summary Lafourche Parish, Plaquemines Parish, and Terrebonne Parish adaptation strategies, and perceived impacts and threats as discussed by key actors.

Parishes	Lafourche	Plaquemines	Terrebonne
Threats	<ul style="list-style-type: none"> • Flooding • Land Loss • Saltwater Intrusion 	<ul style="list-style-type: none"> • Flooding • Land Loss • Saltwater Intrusion 	<ul style="list-style-type: none"> • Storm Surge • Saltwater Intrusion • Land Loss • Flooding • Marsh Loss • Barrier Island Loss
Strategies	Elevation of Highways, Terracing, Marsh Creation, Protection of Native American Burial Grounds, Freshwater Induction, Small Scale Terracing, Limited Property Buyouts, Removing Derelict Boats, Studying Adaptation Strategies for Resilience-Based Housing, Dredging of Sediment, Sediment Diversions, Sustainable Business Incubator, Institution of GOMESA	Population Self Selecting to Leave, Freshwater Diversions, Sediment Diversions, Elevating, Structures. Levees, Marsh Creation	Marsh Creation, Barrier Islands Restoration, Levee Lift and Enhancements, Elevation of Homes, Sediment Dumping, Industry Investment, Freshwater Diversions, Sand Dredging, Barrier Island Reconstruction, Self-Taxation of Parish. Flood Gates, Morganza to the Gulf Levee, Population Internal Migration, Population Relocation
Impacts	Population Loss, Relocation, Marsh Loss, Swamp Loss, Barrier Island Loss, Insurance Rate Increase, Uninsurable due to Flooding, Artificial Sense of Security from Levees, Mental Health Decline, Industry Decline, Industry Shifts in Populace, Increased Storm Surge, Increased Saltwater Intrusion, Changes in Habitat, Fishing Industry Decline	Flooding, Land Change to Open Water, Internal Parish Relocation, Out of Parish Relocation, Loss of Local Revenue, Increasing Insurance Rates, Population Decline, Increased Wave Action, Increased Pressure on Fire Districts, Loss of Estuaries, Increased Saltwater Intrusion, Loss of Access to Industrial Sites, Private Citizen Boats Abandoned in Canals due to Industry Change	Infrastructure Loss, Barrier Island Loss, Internal Population Relocation, Loss of Estuaries Population Relocates Out of the State, Increased Storm Surge, Increased Saltwater Intrusion

Table 3-10 Summary Key Actor Data (This is a depiction of adaptation strategies, and perceived threats and impacts that key actors discuss)

Chapter 4 - Discussion

4.1 Introduction

In this chapter, I discuss the factors that influence the variability of adaptation strategies employed by Lafourche Parish, Plaquemines Parish, and Terrebonne Parish, as discussed in key actor interviews. The results of the key actor interviews are found in Chapter 3 section 4. While there is only minor variation in adaptation strategies between the State of Louisiana and parish-level environmental change documents, the variability of adaptation is amplified when examining key actor interview responses. Using data from the key actor interviews, I argue that the increased variability of adaptation strategies depicted by key actors is the result of two influential factors. First, politics and political systems have significant impacts on local parishes chosen adaptation strategies. Secondly, industries in Coastal Louisiana significantly impact how adaptation is implemented within local parishes.

This chapter progresses as follows: First, I will discuss what is influencing parish to use adaptation, by examining that each parish is responding to environmental change as a broad issue. Secondly, I will discuss how politics influences which adaptation strategies are chosen, and the perceived disconnect between elected officials and appointees within local jurisdictions. Thirdly, I analyze how industries have influenced which adaptation strategies are chosen, resulting in an increased variation of adaptation strategies. Finally, I will discuss how the focus on using technical adaptation strategies to respond to environmental by local governments and State of Louisiana fails to address the goals of the State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast. The data used in this Chapter is the based off the key actor interviews that I conducted and coded as discussed in Figure 2-3.

4.2 Adaptation to What?

Found in Table 3-9, are the perceived threats and impacts of environmental change according to key actor interviews. The threats of environmental change are often comparable between parishes, yet there is significant variability between parishes when discussing key actor perceived impacts. There is no discussion within the key actor interviews that specifically identify an adaptation strategy being employed to prevent a specific threat from impacting a parish.

The only example of a specific threat or impact being addressed occurs in Terrebonne Parish where an elected official stated that industries change an adaptation strategy designed to limit storm surge into the parish. The elected official stated, “Terrebonne Parish has built flood gates to close when storms come in to protect from storm surge, when they close it stops the fisherman from coming in. Due to business outcry, the parish has decided to use a loc system that will keep surge out but allow vessels in and out in a controlled fashion”. An example of a Terrebonne Parish loc system is depicted below in Figure 4-1 where an image displays a loc gate that allows vessels to move in and out of the marshes, while denying saltwater access to interior

marshes.



Figure 4-1 Terrebonne Parish Canal Loc Gate (A loc gate opening for a vessel in Terrebonne Parish)

Aside from the loc gate example, key actors do not discuss if specific threats or impacts influence how an adaptation strategy is chosen and implemented. However, the variability between key actor perceived impacts, suggest that the variability of adaptation between parishes may be influenced by the impacts of environmental change. Even though there is variability between parish environmental change impacts, all parishes are experiencing environmental change in some capacity. As a result, environmental change is framed as broad regional issue, rather than singular influential mechanisms. Determining how influential factors such as politics,

and industry influence the choosing of an adaptation strategy, is the next step in determining why parishes portray a range of variability when choosing an adaptation strategy.

4.3 The Impact of Politics on Adaptation Decision Making

As discussed in Chapter 3, there is more adaptation strategy variability at the local level than the state scale. Furthermore, there is greater variability of adaptation strategies when comparing interviews from key actors to the local parish and State of Louisiana environmental policy documents. The similarity of adaptation strategies between parish documents and the CPRA's Master Plan as discussed in Chapter 3, is the result of local governance trying to adhere to CPRA guidelines. There is more variability of adaptation strategies depicted in the key actor interview results, which shows that there is a disconnect between what adaptation strategies the CPRA employs, and adaptation strategies local governments employ. This disconnect between the CPRA and local parish governments, results from the CPRA failing to understand the authoritative role the CPRA holds over parish environmental change adaptation.

According to an in interview with a CPRA official, the role of the CPRA and the Master Plan is to "determine what projects the state will invest funds in, the master plan does not prevent a parish from spending their own money, but determines what projects the states funds are used on". Furthermore, the CPRA official stated that the "the CPRA is not going to a parish and telling them they have to adopt a plan, and that the CPRA presents the parishes with information. The Master Plan doesn't tell communities what to do but provides information, the OCD, and addresses social adaptation at the community level." However, the CPRA contradicts this notion by arguing that if a parish wants state funding for adaptation, then the Master Plan is used to determine which adaptation strategies are eligible for state funding. Furthermore, the CPRA

argues that they are not a regulatory body, but rather the CPRA provides parishes with the information they need to achieve adaptation. Nevertheless, local parishes must adhere to the CPRA's Master Plan if they want state/federally funded adaptation. Consequently, the CPRA has implicit authoritative power over a parishes ability to employ large scale adaptation projects.

The CPRA's implicit power over parish environmental change is corroborated by a Lafourche Parish official that discusses the implement of adaptation strategies within Lafourche Parish. The Lafourche Parish official stated that "in terms of how they are implemented, parish funding and oil and gas money outside the Master Plan is used for local terracing. But big money from the state and federal government follows the Master Plan."

Consequently, if Lafourche Parish chooses to use non-Master Plan designated adaptation, they are either limited by funding or required to partner with industries who have their own potential agendas. The issue of funding limitations in Lafourche Parish is corroborated by another Lafourche Parish elected official who stated, "everything comes down money, to try and decide where to put limited funds. This is one of the biggest challenges, and we are using BP oil spill money to remove derelict boats from canals."

A Terrebonne Parish elected official corroborates that the CPRA acts as a controlling body stating that "the CPRA chooses a strategy and governor okays the project, and then the parish over sees the work." Another Terrebonne Parish appointed official discusses how small-scale restoration is conducted by landowners stating, "industries are investing in restoration, and even do their own small-scale restoration projects. They understand the risk and what they face." Furthermore, another Terrebonne Parish elected official explains that the parish is selecting ways to fund their own adaptation by stating, "the people of the parish have imposed a tax on themselves to back the support of levees."

In summary, the CPRA says that agency does not tell parishes what actions to take in terms of how to address environmental change, while the CPRA also argues that state and federal funds are allocated based on the CPRA's Master Plan. The local parishes state that small scale funding is conducted via taxation, partnerships with industries, and by using environmental fines from the BP oil spill. The local parishes argue that to achieve large scale adaptation, the funds usually come from the state or federal government. According to the CPRA any state or federal funds used for adaptation must adhere to the Master Plan. Consequently, the CPRA is acting a powerful regulatory agency that lacks the responsibility of being a powerful regulatory agency.

The CPRA's implicit control over local governments has resulted in parish environmental change policy documents being specifically designed to align with the Master Plan, to obtain funding for large scale adaptation. The adaptation strategies discussed in the key actor interviews in Chapter 3 Section 4, display more variability than the Master Plan and parish level environmental policy documents, due to the difference in funding sources discussed by local officials. Although, there is confusion on how the CPRA impacts local parish adaptation, politics continues to play an influential role.

An interview with CPRA official depicts how the State of Louisiana implements an adaptation strategy proposed in the CPRA's 2017 Master Plan. The CPRA official stated "the CPRA solicits projects to parishes and parish organizations, and then we model them and see what projects are the most effective. Then we have a planning tool that allows us to put additional lenses on the outputs of the model, to make sure we are not skewing too far in one direction. All this planning and modeling is reviewed by stakeholders and then once something looks like it makes sense, we take it out for more public input and focus groups. Then, the CPRA releases the draft for the public meetings and makes changes, and the board approves it and

sends it to the legislature that has committee hearings, then full house and senate hearings. Then once both chambers approve it, it becomes a final plan.” This response depicts that politics and political actors play a significant role in the choosing of state level adaptation policy. However, the impact of politics is not limited to state scale environmental governance, local parishes are also impacted by politics when choosing what adaptation strategies to employ.

Specifically, party politics and competition in politics impacts the adaptation to environmental change in Coastal Louisiana. When asked what role politics plays in the choosing and implantation of an adaptation strategy, a Terrebonne Parish elected official stated “there has been a lot of negotiation and improvement on revenues that the state receives compared to the federal government. In the beginning there was nothing substantial for the state government. The federal government used to get everything with a strong democratic representation from New Orleans, at the same time there was a democratic president. We were able to increase the amount of money coming in by hundreds and millions over a course of time, specifically for coastal restoration and conservation”. The competition for funds based on politics is corroborated by a Lafourche Parish official who asserted that, “everyone is pretty much on board at the statewide view. As you get to more local parishes, politics becomes more competitive, but there is a move to more regional coastal approaches as parish lines do not dictate where projects go. It gets more competitive with the money.”

Another Lafourche Parish elected official also corroborated the competitive nature of politics is impacting adaptation funding by stating “everything comes to down to money to try to decide where to put funds with limited funds, which is the biggest challenge”. The official continued to explain that “as a politician it becomes difficult, because if you run into a native you don’t want to say your project is not important, but we have to reallocate your money. Even

within the council we must come to agreements where evenly distributing the funds is not the always the right way to go. The northern parishes want an equal piece of the pie, and there are always concessions. The southern parishes are seeing firsthand impacts, but the northern districts argue they need the money due to people relocating”.

Although some officials argue that politics primarily impacts funding, others take a different stance to argue that political impacts on environmental change adaption is much more driven by a political actors’ personal preferences, rather than science. For example, in Terrebonne Parish one elected official discussed that “they have a lot of people who have their heart into rebuilding the coast, everyone has a different plan, but everyone is working together to what is best. Then you have people where no matter what you do you are never right. When discussing coastal erosion both political parties work together, there is a difference of opinion of how to address coastal land loss and the parties come together. A lot of politicians get mad then do nothing, and if you piss of the governor, he will red line veto projects”.

A Plaquemines Parish elected official corroborates that political decision making is based on personal decisions, when discussing that the proximity to industry revenue, and constituents of political actors impacts a political actors decisions by stating that “politics has more so to do with geographies and economics often impacting decision making, the closer a person is to industries impacted by restoration the less support restoration gets but in large there is overwhelming support for restoration.” The elected official went on to detail that politicians are not at fault, but rather the constituency influences which adaptation decisions are made. The Plaquemines Parish elected official stated, “the people are telling the elected officials what they want, it’s the people stalling not the politicians, the State of Louisiana is not bringing in the local people”. Aside from funding, a political actor’s personal decision is largely impactful on what

adaptation strategies are chosen and implement. There also is a disconnect on the idea that politicians are working together when trying to respond to environmental change.

For example, in Terrebonne Parish an official stated that “the CPRA was created to be the single state agency responsible for costal restoration in partnership with the coastal parishes, the board meetings I have viewed has representatives from every parish.” The official continued to state that “the state plan is vetted throughout Coastal Louisiana through multiple committees in the house and the senate before it is sent to the governor. Things may get changed a little in the legislature, but the legislature doesn’t really fight over it. The state is the one that handles the annual plan and local communities are in included”. Another Terrebonne Parish elected official takes an interesting stance, by agreeing that everyone works together for a common goal. This stance is contradicted within the same interview. For example, the Terrebonne Parish elected official stated that “everyone has different plans and is working together”, but also states that “a lot of politicians will get mad and do nothing”, and “if you piss off the governor, he will red line veto your project.”

A similar inconsistency about political actor agreement occurs in Plaquemine Parish where an elected official stated that “but in large there is overwhelming support for restoration”, and “the people are telling the elected officials what they want, it is the people stalling it’s not the politicians. The State of Louisiana is not representing the local populace.” The same elected official goes on to contradict themselves stating that “The Parish President selects the coastal zone director, the coastal zone advisory committee to an extent. Homeowners are not represented, the business community is not represented, the restoration community is not either, but oil and gas have a designee. Communication between positions that address restoration are isolated to themselves.” The Plaquemines Parish elected officials’ statement directly contradicts

the statement of the Terrebonne Parish official. The Terrebonne Parish official stated that “The state is the one that handles the annual plan and local communities are included”, while the Plaquemines Parish official states that “The State of Louisiana is not representing the local populace”. As a result, there are inconsistencies at the parish level and across parish scale governances when arguing that political systems work together for a common goal.

In summary, politics is directly impacting local parish environmental change adaptation. I argue that political factors likely influence the variation of adaptation strategies between parishes, especially when we consider that Lafourche Parish did not display a disconnect between actors’ perceptions of politics. Although there is an uncertainty about the authoritative role of the CPRA, the impact of politics on adaptation, other factors such as industry influence adaptation as well.

4.4 Industry Influence on Adaptation Decision Making

Industry action is influencing the environmental change adaptation strategies employed by Lafourche Parish, Plaquemines Parish, and Terrebonne Parish. For instance, industries may act as a funding source or employing lobbyist to influence what adaptation strategies are chosen by parish governments. In Lafourche Parish an official discussed how industries influenced the implementation of parish adaptation strategies via funding and partnerships. The Lafourche Parish official stated, “oil and gas industries are partnering with the parish, as well as NGOs such as coastal advocacy groups for terracing and small-scale marsh creation groups such as Conoco Phillips and Ducks Unlimited.” The official also stated “Port Fourchon funds and supports marsh creation”. While in Terrebonne Parish, a Terrebonne Parish elected official corroborated that industries are investing in adaptation stating, “industries are investing in restoration and even do their own smaller scale restoration projects, they understand the risk and what they face.” As

shown above, industries are actively investing in environmental change adaptation. Industries also influence adaptation through using lobbyist to influence how parishes select adaptation strategies.

Industries actively influence how parishes select and implement adaptation strategies by using lobbyists. For example, in Terrebonne Parish, an elected official stated that “Terrebonne Parish has built flood gates to close when storms come in to protect from storm surge, stops the fisherman from coming in. Due to business outcry, the parish has decided to use a loc system that will keep surge out but allow vessels in and out in a controlled fashion.” An example of loc system is depicted in Figure 4-1, which displays a loc gate in Terrebonne Parish. Another Terrebonne Parish elected officials agrees that industries are changing adaptation strategies using lobbyist, however the changes in industry influenced adaptation is not always in the best interest of the environment. The elected official argues that industries are resisting adaptation by stating that “the sea food industry groups fight against freshwater diversions because the freshwater entering the saltwater killed millions of oysters when they opened it to stop community flooding.”

The use of industry lobbyist to influence adaptation is also occurring in Plaquemines Parish. A Plaquemines Parish elected official stated that “the sea food industry has pushed back against sediment diversions, where companies are perceiving that diversions are limiting oyster production. For example, companies blamed the Mardi Gras Pass diversion, even though land is built by Mardi Gras Pass. Decision makers are choosing not support diversions to get reelected.” The same Plaquemines Parish elected official also argues that industries have direct impacts on parish politics stating that “oil and gas have a designee with the coastal zone advisory committee”, and “the industries do have a say, any environmental impact survey has public and

industry comments. There are grass roots movements looking at the negative impacts of diversions and the coastal restoration that is done.”

As shown above, industries are directly impacting the way in which a parish chooses and implements environmental change adaptation strategies. First, the industries are both funding and partnering with parishes to achieve smaller scale adaptation that aligns with their business agendas. Secondly, the industries are actively influencing parish adaptation decision making by using lobbyist to influence or change parish adaptation strategies to adaptation to fit their agenda.

4.5 A Single-Pronged Approach to Adaptation

This section discusses how the Master Plan primarily uses adaptation category (2) Change the Environment as the preferred adaptation category to combat environmental change. The categories of adaptation framework I created can be displayed in Table 2-1 as the preferred adaptation category to combat environmental change. The emphasis on using adaptation category Change the Environment, contradicts some of the CPRA’s goals. Specifically, the CPRA states on page ES-8 of the Master Plan the importance of their mission is to continue to “funding and implementing strategic measures to reduce and mitigate risk and to improve the sustainability of the coast. By doing so we improve the resilience of our economies, increase protection for Louisiana homes and businesses, improve health of our coastal ecosystems, and support the future of our unique cultures and communities (CPRA 2017).”

Although some of the goals stated in the quote above are addressed by using employing Change the Environment, community and culture are not. The primary focus of the Master Plan is using physical responses to “support unique cultures and communities” (CPRA 2017).

I argue that the use of physical adaptation strategies employed by the CPRA does not adequately address culture, considering culture is not limited physical places. For example, in Gallagher (2016)'s article Isle De Jean Charles residents state that "we are going to lose all our heritage, all our culture." Furthermore, the CPRA fails to address culture in the way that culture is defined by social science.

Blumenthal (1940)'s who defines a culture as "a culture complex (necessarily a complicated one) (1) in which a group (usually a large one) of human beings give expression to their major cultural activities, (2) that usually is quite different from any other body of functionally inter-related culture traits in which a group of human individuals give expression to most of their cultural activities, (3) that usually has a geographical area on which it predominates and (4) that is usually largely functionally independent of other similar complexes". Rather than addressing culture in the way that Blumenthal (1940) defines culture, the CPRA uses culture in a colloquial way of describing groups of people.

A CPRA official argues that the CPRA addresses culture by stating "we talk to front line communities, we translate documents into Vietnamese and French, small groups of citizens look of draft plan over a meal with CPRA folks and NGOs instead of auditorium style meetings to create a more inviting space. We are always trying to involve that side of that plan." As a result, I argue that the term culture is merely as colloquialism by the CPRA when describing the vast groups of people that the CPRA engages with when conducting public outreach. I base my assertion of three factors. First, the Master Plan emphasize using adaptation category Change the Environment to respond to environment change and fails to account for one of their goals to protect community and culture. Additionally, Isle De Jean Charles's is experiencing

environmental change that has resulted in the residents expressing that their culture is being lost. Finally, the CPRA fails to understand culture in a way that social science defines culture.

4.5 Summary

In summary, there is limited variability of adaptation strategies when comparing Lafourche Parish, Plaquemines Parish, Terrebonne, and the local parishes compared to the State of Louisiana adaptation document. However, when discussing adaptation strategies with key actors, there is far more variability between parishes, and the local parishes compared to the State of Louisiana. The limited variability between documents, and the increased variability discussed by key actors is a result of three factors that influence adaptation decision making. First, there is little discussion of how the varying threats and impacts of environmental change across parishes influence a specific chosen adaptation strategy. There is a limited amount of variability in both documents and key actor interviews when examining the threats of environmental change. However, when discussing the impacts of environmental change there is a significant amount of variability between parishes, and between parishes and the State of Louisiana.

As a result, I argue that the increased variability of adaptation strategies discussed by key actors is influenced by the variability of environmental change impacts that key actors discuss. A visualization of adaptation strategies, and environmental change threats/impacts discussed by key actors is found in Table 3-9. I also argue that considering the lack of explanation discussing what threat or impact influences chosen adaptation strategies, that environmental change is viewed as an overarching region problem. Secondly, politics is influencing adaptation strategies chosen in Lafourche Parish, Plaquemines Parish, and Terrebonne Parish. First, the CPRA fails to recognize the authoritative power that the organization holds over parishes as they pursue funding

sources when implementing adaptation strategies. The CPRA views themselves an agency that provides recommendations, however, the parishes recognize that to receive state and federal funds for adaptation, the parishes must ensure that adaptation strategies align with the CPRA's Master Plan. Also, at the state scale the CPRA's Master Plan goes through multiple revisions by political actors. Consequently, according to key actor interviews state political actors approve or deny parish level adaptation based on personal feelings, rather than science.

At the parish scale, there is also competition between political actors when actors are obtaining funds for adaptation. The competition between political actors pursuing adaption has resulted in political actors accepting concession to achieve the implementation of adaptation policy. Additionally, key actor interviews at the parish scale display that there is disagreement when asked if political actors are working together when responding to environment change. Some actors argue that everyone is working together, while in the same interview the key actor states that actors are working against each other, because they are influenced by their own biases, and constituent's agendas. Key actor interviews also depict that actors often disagree with other officials in same parish when discussing if there is political cooperation when responding to environmental change.

Thirdly, industries are impacting which the adaptation strategies a parish employs when responding to environmental change. Industries in the region influence funding by partnering with parishes to fund adaptation strategies within the parish. The funding that industries are providing allows local parishes to achieve adaptation without adhering to CPRA guidelines.

Industries are also influencing what adaptation strategies are chosen by parish governments using lobbyist. Some industries are using lobbyist to change an adaptation strategy that chosen by the parish into an adaptation strategy that better serves industry desires. Industries

in the region also use lobbyist to directly influence parish adaptation politics, by lobbying that industries being represented in adaptation centric committees and boards within the parish government

I also found that the State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast provides only physical solutions to combat environmental change, while failing to address culture and using culture in a colloquial way to describe people. Consequently, I argue that the variability of environmental change impacts, politics, and industry impacts are the factors that influence the variability of adaptation strategies between parishes, and between the parishes and the State of Louisiana.

Finally, considering the limited adaptation variability between State of Louisiana and local level documents, and the increased adaptation variability discussed with key actors, the topic of alignment between local parishes and The State of Louisiana is rather complex. I argue that when examining the State of Louisiana, and Lafourche Parish, Plaquemines Parish, and Terrebonne Parish environmental documents there is alignment between the local parishes and State of Louisiana. The alignment parish documents, and the State of Louisiana exist, because parish document is designed to complement the Master Plan so that local parishes can obtain state and federal adaptation funding. While at the local scale, alignment between parishes and between parishes and the State of Louisiana is more complex. The complexity of alignment is caused by the variability of environmental change impacts, political, and industrial influences. As a result, when considering large scale adaptation, local parishes aligns with the State of Louisiana. However, considering the influential factors discussed above, small scale adaptation is more complex and less likely to align with the state government.

Chapter 5 - Conclusions

5.1 Research Summary

Coastal Louisiana accounts for 44.3 percent of Louisiana's population and is vastly important to the United States as a deltaic plain, considering that the region is worth upwards of \$47 billion (CPRA 2017). The deltaic region of Coastal Louisiana is rapidly changing from freshwater marshland to open ocean at a rate of 10.37 square miles annually (Couvillion et al. 2018) From 1932-2000 Coastal Louisiana has lost upwards of 1,900 square miles of land. The land change occurring in Coastal Louisiana is causing an overall decline in the local ecosystems, and if unchecked the local ecosystems are likely to experience total ecosystem collapse (Louisiana Department of Natural Resources 1998).

The State of Louisiana aims to address the environmental change that is occurring by using the State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast. The Master Plan allocates \$150 billion in 50 years for environmental change adaptation (Coastal Protection and Restoration Authority of Louisiana 2017). Also, the Master Plan prescribes 124 projects that will build and or maintain 800 square miles of land over the next 50 years. Although the Master Plan depicts the State of Louisiana's chosen adaption strategies, there is little examination of parish level adaptation planning. Furthermore, scientific literature examining environmental change is limited to niche field specific studies.

Using my adaptation strategy framework , a document analysis of the State of Louisiana's 2017 Master Plan, and parish environmental change documents, and key actor interviews in a multi- case comparative study analysis I answer the following the research

question; *how do local adaptation strategies align with the State of Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast?*

To answer my primary research question, I have developed three objectives:

- 1) *Compare how local and state governments align in their pursuit of adaptation strategies to Environmental Change.*
- 2) *Identify the perceived constraints that local government face in choosing an adaptation strategy.*
- 3) *Identify the perceived threats from environmental by local governments in Coastal Louisiana.*

Additionally, I hypothesize that *environmental change adaptation strategies employed by local parishes vary between parishes, and the State of Louisiana because of the variation in social context.*

Results indicate that at the state scale the preferred adaptation strategy is to Change the Environment. Although there is variability between chosen adaptation strategies at the parish scale, the preferred adaptation strategy chosen is Change the Environment. Between parish environmental policy documents, and the State of Louisiana there is limited variability between adaptation strategies employed. Yet, when discussing adaptation with key actors there is more variability of environmental change impacts and adaptation strategies. When key actors there is more variability of chosen adaptation strategies.

According to key actor interviews there tends to be three factors that influence adaptation strategies: First, There is variability between parishes perceived environmental change impacts that potentially influence adaptation strategy variability. Furthermore, there is a lack of discussion on what threats and impacts influence the choosing of an adaptation strategy, rather parishes are united in combating environmental change as an overarching theme. Secondly,

politics impacts what adaptation strategies are chosen by local parishes. Specifically, there is a miscommunication between the local parishes and the CPRA, when discussing the authoritative role of the CPRA. The CPRA views themselves as body that provides recommendation on potential adaptation strategies, however, the CPRA is an agency that approves or denies adaptation projects, and funding for large scale adaptation. Local parishes view the CPRA as the way to receive large scale adaptation funding, resulting in parish documents being designed to align with CPRA Master Plan parameters. The miscommunication of the CPRA's role depicts that the agency acts as an authoritative body, without the responsibilities of an authoritative body. Additionally, the CPRA has implicit power over how parishes choose and implement environment change adaptation.

At the state scale political systems review the CPRA's Master Plan, and political actors are approving and denying adaptation plans based on personal feelings, rather than science. There is also a disagreement between key actors across local parishes disagree about the ability of key actors to work together when responding to environmental change. In key actor interviews, the key actors often contradicted themselves when discussing political cohesiveness. Additionally, actors within the same governance jurisdiction disagree with each other when discussing political cohesiveness.

Industries are extremely influential on how parish driven environmental change adaptation is chosen and implemented. Industries impact parish adaptation in two fundamental ways. First industries use funding and partnerships with the parishes to achieve small scale adaptation. Secondly, industries use lobbyist to push for changes in adaptation to fit industry needs, and to obtain positions on environmental response committees and boards within parish governments. With a high confidence, I argue that these three factors are a influential factors that

cause variability between parish and State of Louisiana environmental change adaptation strategies as discussed in Chapter 3.

Finally, I also found that the Master Plan provides physical response-based adaptation as the preferred method of adaptation to environmental change. However, the use of physical responses as the preferred method of adaptation negates one of the Master Plans goal to support community and culture. Furthermore, the Master Plan uses the term culture as colloquialism for groups of people, rather than addressing culture as defined by Blumenthal (1940).

After examining the limited adaptation variability between state and local level documents, and the increased adaptation variability discussed with key actors, I argue that alignment of adaptation between local parishes and The State of Louisiana is extremely complex. Specifically, when discussing large scale adaptation, I argue that alignment between the State of Louisiana and the parish is present. However, after analyzing interview data, I argue that parish level adaptation is extremely complex and not clear, especially in the context of smaller scale parish driven adaptation. Consequently, I cannot say with a high confidence that there is alignment between the State of Louisiana, and local parishes when examining adaptation due to the complexity of influential factors.

5.2 Contribution to Broader Literature

This study compliments the work of Warner et al (2010) as discussed in Chapter 1 section 2. Warner et al (2010) argues the communities can adapt to environment change by choosing to “stay and adapt to mitigate the effects”, “stay, do nothing and accept a lower quality of life”, “leave the affected area:”. Warner et al (2010)’s framework falls short by not giving specific examples of ways that communities can mitigate the impacts of environmental change.

In response to Warner et al (2010)'s framework I created six categories of adaptation decisions that communities may pursue when responding to environmental change. For example, a community can choose to "Do Nothing, Change the Environment Change the Communities Relationship to The Environment, Relocate The Community, Adaptation Capacity Building, and Other. The categories of adaptation are shown in Table 2-1.

My study also responded to discussions of adaptation in political ecology literature. Liverman (2015) argues that adaptation research is lacking in answering the hard questions of climate research where complexity and future climate considerations are negated. This study responds to a call by Liverman (2015) by analyzing complex systems, instead of studying simplistic problems. Specifically, I responded to Liverman (2015) by analyzing the systems that influence how local communities align with higher scales of governance in the context of environmental change, and further answers what factors influence local scale adaptation. Additionally, I provide recommendations for future research on Coastal Louisiana environmental change.

This research also speaks to Basset and Fogelman (2012) who state that adaptation research is lacking discussions of politics. I address Basset and Fogelman (2012)'s criticism by examining the way in which politics impacts how adaptation strategies are chosen and implemented by local governance This study also contributes to political ecology literature by examining the power dynamics present in both environmental change politics, and how industries influence adaptation, and by discussing the power dynamic that exist when examining the relationship between the CPRA and local governance in Coastal Louisiana.

5.3 Recommendations for Future Work

Based on the results of this study I provide 8 recommendations for future research to help expand adaptation literature discussing Coastal Louisiana environmental change. First, there is need for a study that specifically examines the relationship between local parishes and the CPRA, Specifically, this study is needed to ascertain to what degree parishes rely on the CPRA for funding and guidance when instituting adaptation strategies, and the power that the CPRA has over local parishes. Secondly, further research is needed to examine how much power state political actors have over the implementation of independent adaptation projects, and if there any checks and balances in place to limit bias when approving or denying a project.

Thirdly, there is a significant need for future research to examine how much CPRA and parish projects change from the modeling and science, to the implementation of the project. Specifically, this question needs to be addressed in the context of industry and stake holder input on adaptation strategies as discussed in Chapter 4 sections 3 and 4. Fourth, in order to address the Master Plan's goal of protecting unique cultures, the CPRA needs to include adaptation strategies that address culture according to Blumenthal (1940)'s definition, rather than being biased to bio-physical adaptation. Fifth, there is a need for further research in social science fields such as Cultural Ecology, Political Ecology, Cultural Anthropology, and Cultural Psychology to determine the cultural impacts of environmental change, and the best adaptation strategies to mitigate environmental change impacts on culture and communities.

Sixth, considering the amount of difficulty I had in finding parish documents, and the lack of time synchronization between parish documents, I argue that the local parishes should produce comprehensive adaptation master plans along the same five-year time span as the CPRA's Master Plan. Seventh, there is need further research examining why the CPRA views

land loss as the overarching problem in Coastal Louisiana, instead viewing the problem in a holistic manner as environmental including both positive and negative feedback loops. Finally, there needs to be a study that examines the CPRA's use of practicing implicit relocation when Non-Structural Risk Reduction that practices property acquisitions.

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Appendix A - Informed Consent

Consent for Participation in Research Interview

Project name: Adaptation to Coastal Environmental Change in Louisiana: An Analysis of Local and State Environmental Governance Relationships

Funded by: Department of Geography, Kansas State University

Research Investigator: Michael S. Molloy (Graduate Student)

Academic Advisor: Audrey J. Joslin, Ph.D.

Purpose of the Research Project:

This study is being conducted by Michael Molloy, a graduate student in the Department of Geography, Kansas State University, as a partial fulfillment of the requirement of the Master of Arts degree. This study examines how local government and state government in Louisiana align in strategies to adapt to coastal environmental change (net land reduction). It aims to illuminate the diversity of adaptation strategies pursued by local governments and their relationship to state policy. This research will further knowledge about the diversity of local government responses to environmental change and may contribute to informing and future policy on coastal environmental change in the Mississippi Delta region.

Project Description:

Coastal Louisiana supports nearly 30% of the United States fisheries, 10-14% of U.S oil industry, and 44.4 % of Louisiana's employment. Louisiana is experiencing extensive environmental change as 16.6 square kilometers of land is lost annually. Environmental change is caused by a combination of anthropogenic, non-anthropogenic factors, having tremendous impacts on the coastal communities. The state government has responded by producing the Coast 2017 Master Plan. Although the plan is comprehensive, environmental change adaptation strategies vary between parishes. My research aims to examine how Lafourche, Terrebonne, and Plaquemines Parishes environmental change adaptation strategies align with the Coast 2017 Master Plan. You maybe be contacted later to clarify any content we may have discussed.

Project Procedures:

You have been asked to participate in this interview due to your knowledge and experiences about this community. The Institutional Review Board (IRB of Kansas State University) requires interviewees to explicitly agree to being interviewed and know how their information contained in their interview will be used. The interview will take between 20-60 minutes. We do not anticipate any risk associated with your participations, but you have the right to stop the interview or withdraw from the research at any time. Furthermore, names will be retained with the transcripts, but will not be included in any materials published or produced from this research. Only the name of the parish and title/position will be included in any materials published or produced from this research. Furthermore, Individual names will not be released and/or masked in any reporting of information. Any data shared for additional research purposes will likewise not include individual names.

Questions or Feedback:

For any questions or feedback please contact Michael Molloy (molloym92@ksu.edu or 785-341-2075) or Audrey Joslin (ajoslin@ksu.edu) at 1002 Seaton Hall, Department of Geography, Kansas State University, Manhattan KS, 66502. For concerns or to gain further information about your rights as a participant, you may contact the University Research Compliance Office at 785-532-3224, or Fax at 785-532-3278, or by email at comply@ksu.edu

Please indicate your approval of audio recording to ensure accuracy in reporting:

I do agree to audio recording [☐].

I do not agree to audio recording and prefer that information be recorded in note form by the researcher [☐].

Your signature below confirms your understanding of the study and agreement to participate.

Please note there are two potential signature lines and sign the appropriate one based on the level of identity protection you desire written and oral reporting of the research project.

X: _____

Date: _____

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Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.

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