

Fall 12-18-2014

## Coastal Land Loss and Collaborative Resource Governance: The Case of Plaquemines Parish, Louisiana

Nandini Seth

THE UNIVERSITY OF NEW ORLEANS, nandiniseth.85@gmail.com

Follow this and additional works at: <https://scholarworks.uno.edu/td>



Part of the [Cultural Resource Management and Policy Analysis Commons](#), [Natural Resources Management and Policy Commons](#), and the [Urban, Community and Regional Planning Commons](#)

---

### Recommended Citation

Seth, Nandini, "Coastal Land Loss and Collaborative Resource Governance: The Case of Plaquemines Parish, Louisiana" (2014). *University of New Orleans Theses and Dissertations*. 1955.

<https://scholarworks.uno.edu/td/1955>

This Thesis is protected by copyright and/or related rights. It has been brought to you by ScholarWorks@UNO with permission from the rights-holder(s). You are free to use this Thesis in any way that is permitted by the copyright and related rights legislation that applies to your use. For other uses you need to obtain permission from the rights-holder(s) directly, unless additional rights are indicated by a Creative Commons license in the record and/or on the work itself.

This Thesis has been accepted for inclusion in University of New Orleans Theses and Dissertations by an authorized administrator of ScholarWorks@UNO. For more information, please contact [scholarworks@uno.edu](mailto:scholarworks@uno.edu).

Coastal Land Loss and Collaborative Resource Governance:  
The Case of Plaquemines Parish, Louisiana.

A Thesis

Submitted to the Graduate Faculty of the  
University of New Orleans  
in partial fulfillment of the  
requirements for the degree of

Master of Urban and Regional Planning

by

Nandini Seth

B.A. Maharaja Sayajirao University of Baroda, 2007  
M.A. Maharaja Sayajirao University of Baroda, 2009

December, 2014

## Acknowledgement

I would like to express my sincerest gratitude to all my professors who made the completion of this thesis possible. I am deeply indebted to my committee chair members Dr. David Gladstone and Dr. Traci Birch for their continued guidance throughout my graduate education. I am thankful for the guidance and valuable expertise that I received from Dr. Shirley Laska. I must also acknowledge Mr. David Lambour for his help and generosity, throughout the program, that helped me meet the graduate school deadlines.

This thesis would not have been possible without the love and encouragement of my family and friends. I wish to thank my father Mr. Amar Seth, mother Mrs. Mita Seth for their continued support from India. Thanks to my brother and sister-in-law for cheering me up and providing words of encouragement.

Thanks to my dear friends Rajni Soharu and Bhaskar Dihingia for patiently reviewing and proofreading my thesis.

Special thanks to my husband and friend Dr. Amitdyuti Sengupta for his incredible support throughout the course of the program. You always knew how to inspire and encourage me.

## Table of Contents

Glossary of Key Terms and Acronyms .....	v
List of Tables .....	vi
List of Figures .....	vii
Abstract .....	viii
Chapter I .....	1
<i>Introduction</i> .....	1
Chapter II .....	4
<i>Scope and Objective</i> .....	4
<i>Need for Research</i> .....	4
<i>Research Questions</i> .....	5
<i>Specific Objectives</i> .....	6
Chapter III .....	7
Background .....	7
<i>Coastal land loss in Louisiana</i> .....	7
<i>Coastal Land Loss in the Plaquemines Parish</i> .....	8
Chapter IV .....	11
Literature Review .....	11
<i>Environmental Resource Management and Collaborative Governance</i> .....	12
<i>Coastal Restoration Plans</i> .....	17
<i>Coastal Plan Focus Area</i> .....	39
<i>Gaps in the Literature</i> .....	50

<i>Restating the Research Questions</i> .....	51
Chapter V.....	52
Methodology .....	52
<i>Introduction</i> .....	52
<i>A Case Study Research Design</i> .....	52
<i>Case Study Selection Criteria</i> .....	53
<i>Data Analysis</i> .....	54
<i>Generalizing from a Case Study to Theory</i> .....	54
Chapter VI.....	63
Assessing Intergovernmental Coordination in Plan Focus Area.....	63
<i>Coastal Water Resource Management</i> .....	64
<i>Coastal Land Use and Regulations</i> .....	71
<i>Dredging and Diversion: The Preferred Method for Restoration</i> .....	78
<i>Funding and Implementation of Plans</i> .....	83
<i>Institutional Issues and Federal Consistency Provision</i> .....	86
Chapter VII.....	89
Discussion and Conclusion .....	89
<i>Recommendations</i> .....	89
Bibliography .....	92
Appendix A.....	98
Appendix B.....	113
Vita.....	114

## **Glossary of Key Terms and Acronyms**

**CZMA:** Coastal Zone Management Act;

**CWPPRA:** Coastal Wetlands Planning, Protection and Restoration Act;

**LCA:** Louisiana Coastal Area;

**CIAP:** Coastal Impact Assistance Program;

**CZMP:** Coastal Zone Management Program;

**PPSIP:** Plaquemines Parish Strategic Implementation Plan;

**MSA:** Metropolitan Statistical Area;

**CWA:** Clean Water Act;

**EPA:** Environmental Protection Agency;

**NEPA:** National Environmental Policy Act;

**OCS:** Outer Continental Shelf;

**USACE:** United States Army Corps of Engineers;

## List of Tables

Table 4.1 Intergovernmental coordination and conflicts in Water Resource Management .....	42
Table 4.2 Intergovernmental coordination and conflicts in Land Use Planning .....	44
Table 4.3 Intergovernmental Coordination and Conflicts in the Preferred Method of Restoration .....	47
Table 4.4 Intergovernmental Coordination and Conflicts in Funding and Implementation .....	49
<b>Table 6.1</b> Water Resource Management Summary .....	70
<b>Table 6.2</b> Land Use Planning Summary .....	77
<b>Table 6.3</b> Dredging and Diversion Summary .....	82
<b>Table 6.4</b> Funding and Implementation Strategy Summary .....	85
<b>Table A-1</b> Major Hurricanes in Louisiana .....	104
<b>Table A-2</b> Land and Water Area .....	105
<b>Table A-3</b> Trends in Population Pre and Post Katrina in the Coastal Parishes .....	107
<b>Table A-4</b> Repetitive Flood Loss Analysis .....	108

## List of Figures

Figure 1.1 Schematic of the Thesis Study Plan .....	3
<b>Figure 3.1</b> Historical and Projected land loss in Southeast Louisiana (1932-2050) .....	8
<b>Figure 3.2</b> Existing Levee System in Plaquemines Parish .....	9
<b>Figure 3.3</b> Plaquemines Parish Land Loss (1932-2009) .....	10
<b>Figure 4.1</b> Regions of Coast 2050.....	24
<b>Figure 4.2</b> CPRA Multiple Lines of Defense Strategy in PPSIP .....	27
<b>Figure 4.3</b> Land Use Map of Plaquemines Parish.....	36
<b>Figure 4.4</b> Plaquemines Parish Coastal Restoration Environmental Zones (after Plaquemines Parish Strategic Implementation Plan, 2008) .....	39
<b>Figure 6.2</b> Land Use Conflict in Plaquemines Parish .....	72
<b>Figure A.1</b> Active Oil and Gas Production Platforms in the Gulf of Mexico .....	100
<b>Figure A.2</b> Projections of Percent Land below Sea Level by Coastal Parish.....	101
<b>Figure A.3</b> Regional Range of the Subsidence Rate .....	102
<b>Figure A.4</b> Historical Hurricane/Storm track over Plaquemines Parish (1956-2005) .....	104
<b>Figure A.5</b> Nutria Harvest per Parish (2010-2011 Season).....	106



## **Abstract**

The research, presented here, is about the collaborative governance and adaptive management in coastal planning efforts of Louisiana. Fundamental conflict, between the idea of environmental conservation and developmental growth, has always existed in the coastal regions. The presence of the large number of environmental laws, at various levels of government and their different management objectives for utilization of coastal resources, requires study of intergovernmental relationship. Taking Plaquemines Parish as a case in point, this thesis will, therefore, review the critical restoration plans for intergovernmental coordination and conflicts. It will also provide recommendations, for elected representatives and policy makers, with an aim to promote collaborative governance and improve adaptive management of coastal resources.

**Keywords:** Coastal Restoration, Coastal Restoration Policies, Intergovernmental, Louisiana Coastal Master Plan, Plaquemines Parish, Adaptive Management.

# Chapter I

## Introduction

Anthropogenic activities such as development of real estate, diversion of the river course, gas exploration and production, installation of storm water protection (levees or breakwaters), and harvesting of coastal and marine resources have led to severe stress on the sensitive and fragile coastlines worldwide. According to the World Resources Institute (Bryant et al. 1995), 75 percent of the world's population, in the year 2025, will be residing in or around the coastal area.

Loss of coastal land is a critical issue in Louisiana (LA), which consists of almost 40 percent of all coastal wetlands in the United States. According to the recent estimates, Louisiana is losing vital coastline at the rate of one-football field per hour (Couvillion et al. 2011). Natural phenomena such as hurricanes, associated storm surges, sea level rise, and ground subsidence tend to exacerbate episodes of coastal land loss. Government agencies are largely cognizant of the severity and impacts of the current coastal situation. Coastal restoration planning in Louisiana involves multiple agencies, at the federal, state and local levels, drafting and implementing various policies with the intent to stop or reduce land loss and promote a vision to regenerate lost coastal ecosystems. A review, of existing governmental regulations, indicates that there are too many policies that aim simultaneously at coastal development and restoration. It is, therefore, evident that the loss of coastal land and associated ecosystems is an issue that would need a coordinated governmental policy effort to halt and reverse the current trend.

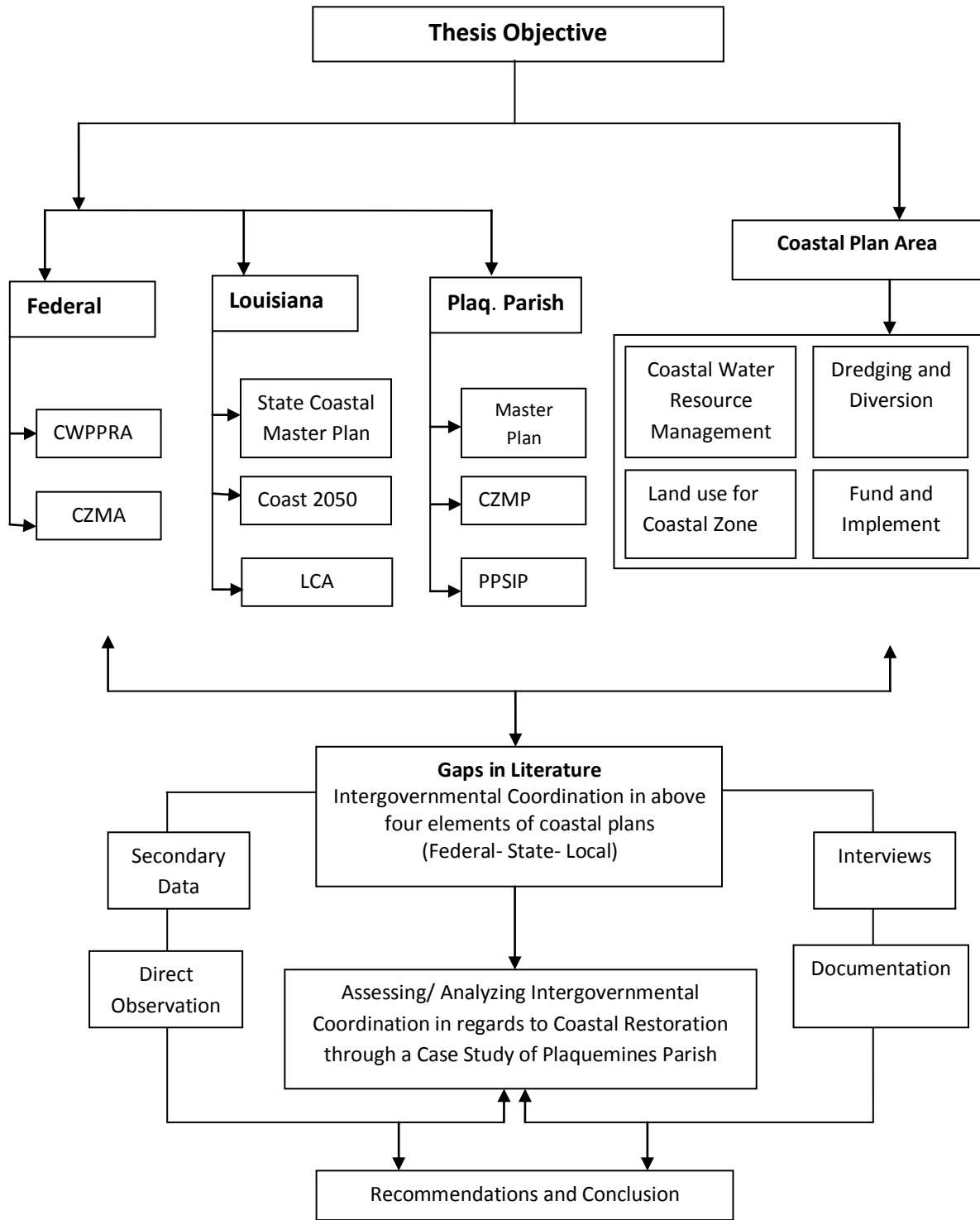
To understand the dynamics of intergovernmental working, this thesis makes an attempt to review the critical coastal restoration plans generated by the federal, state (Louisiana) and local (Plaquemines Parish) governments. At the local level, Plaquemines Parish is chosen for the case study because of its unique geographical location, susceptibility to sea level rise and subsidence, repetitive flooding and storm events. Several coastal restoration plans and initiatives

are developed at both the state and local levels, with inputs from various federal resource agencies. The presence, of multiple federal, local and state government agencies, which have coordinated in the policy/plan making process oftentimes, has differing results in the plan implementation processes. Therefore, there is a need to assess intergovernmental coordination and conflicts (in the existing plans) that are potentially hampering the coastal restoration and regeneration objective in four coastal restoration focus areas, identified broadly as; 1) coastal water resource management, 2) dredging and diversion, 3) coastal land use planning and 4) funding and implementation of the plans. This thesis further discusses the implication of collaborative governance on the process of adaptive management in the coastal zone.

Based on the findings of the research, this thesis provides medium and long-term recommendations, for elected representatives and policy makers, to reduce any intergovernmental conflicts in the planning and adaptive management of the coastal resources. Figure 1.1 below shows schematic of the study plan and critical tools implemented to realize the scope and objective of this research. Acronyms used in the Figure below are:

1. **CZMA**: Coastal Zone Management Act;
2. **CWPPRA**: Coastal Wetlands Planning, Protection and Restoration Act;
3. **LCA**: Louisiana Coastal Area;
4. **CIAP**: Coastal Impact Assistance Program;
5. **CZMP**: Coastal Zone Management Program;
6. **PPSIP**: Plaquemines Parish Strategic Implementation Plan.

**Figure 1.1 Schematic of the Thesis Study Plan**



## **Chapter II**

### **Scope and Objective**

The scope of this thesis is to assess intergovernmental coordination in four major foci of coastal restoration plans that address land loss. Plaquemines Parish has been chosen as a case study because it is among the most vulnerable parishes in terms of land loss in Louisiana. Although numerous coastal restoration plans were initiated at the local level, very few gained funding or support from the higher levels of government. The objective of this thesis, therefore, is to bring attention to coastal restoration planning in Louisiana, and recommend ways, from the angle of intergovernmental coordination, to improve the planning and adaptive management of coastal resources.

### **Need for Research**

My review of the available literature indicates that progress towards sustainable coastal restoration depends on integrated efforts at each jurisdictional level (Burby and May 1998). The gaps, in the available literature, identified below are discussed in detail in chapter IV. This work has implications for all large environmental restoration projects, and the threat of climate change and sea level rise guarantee that projects of this scale will be planned for and completed in the future. Based on my review of the available literature, the following gaps have been observed:

1. A review of the literature identified many studies on coastal Louisiana, but did not establish a robust analysis of coastal planning and intergovernmental coordination in the state;
2. Current studies lack the effectiveness and need for intergovernmental coordination in specific issues like funding of coastal projects and implementation, land use planning and coastal water resource management in the state;

3. There has been much discussion and study about adaptive management (Berke and Conroy 2000, Stankey, Clark, and Bormann 2005, Day et al. 2007, Holling 1978). By definition, adaptive management is a structured process for decision-making by learning how the coastal system responds to coastal protection and restoration programs and then using the knowledge gained to make adjustments in order to improve future management decisions. Although the adaptive management framework consists of a stepwise approach for decision-making and creating a knowledge base, intergovernmental coordination is not often a part of the discussion in the existing literature. In order to discuss and implement an adaptive management plan efficiently, continuous monitoring is needed to gain an understanding of the effectiveness of each plan element at all levels of government. Adaptive management studies, generated without assessing intergovernmental coordination, therefore, have the potential to overlook a crucial aspect of the coastal zone management problem to some extent. Hence, specific area and plan element based approaches, towards understanding coordination between all levels of government, is a necessity.

### **Research Questions**

Throughout the study, the analysis will consider three main research questions:

1. What policy initiatives were taken at various levels of government to address the issues of land loss in Plaquemines Parish?
2. Are there intergovernmental conflicts in the four identified coastal restoration plan foci chosen for this study (i.e. coastal water resource management, dredging and diversions, coastal land use planning and funding and implementation)?
3. How can adaptive management and intergovernmental coordination make the Plaquemines Parish coastal restoration process more efficient?

## Specific Objectives

In order to answer the research questions, I attempted to meet the following objectives during the course of my research:

1. Understand the land loss trends and related effects on the Plaquemines Parish as a result of extreme weather events and continual coastal erosion;
2. Investigate the critical coastal restoration planning efforts such as the Coastal Wetland Planning, Protection and Restoration Act (CWPPRA) and Coastal Zone Management Act (CZMA) at the federal level; Coast 2050, Louisiana Coastal Area (LCA), Coastal Impact Assessment Program (CIAP) and State Coastal Master Plan at the state level; and the land use and coastal restoration and protection elements of the Plaquemines Master Plan, Coastal Zone Management Program (CZMP) and Plaquemines Parish Strategic Implementation Plan (PPSIP) at the local Parish level of the government;
3. Assess and analyze the intergovernmental coordination in various coastal plan elements. The selected plan elements are; 1) coastal water resource management, 2) dredging and diversion, 3) coastal land use planning and 4) funding and implementation of plans;
4. Study and investigate the theory of adaptive management and its role in Louisiana's coastal planning efforts;
5. Provide medium and long-term recommendations, for elected representatives and policy makers, with an aim to close any intergovernmental conflict and to improve the process of adaptive management.

## Chapter III

### Background

#### *Coastal Land Loss in Louisiana*

For centuries, humans have regarded the coastal zone as a perennial and inexhaustible supply of food, transportation, real estate and energy. More than half of the world's population (approximately 3.6 billion people) live along the coastline or within 124 miles of one (Creel 2003). Population projections indicate, that by 2025, about 75 percent of the world's population could reside in and around coastal areas (Bryant et al. 1995). However, such population pressure stresses sensitive and fragile coastal ecosystem. United Nations Environmental Program (UNEP) projected that 91 percent of the world's coastline degradation and 80 percent of the ocean pollution is due to urban development (Allsopp et al. 2006).

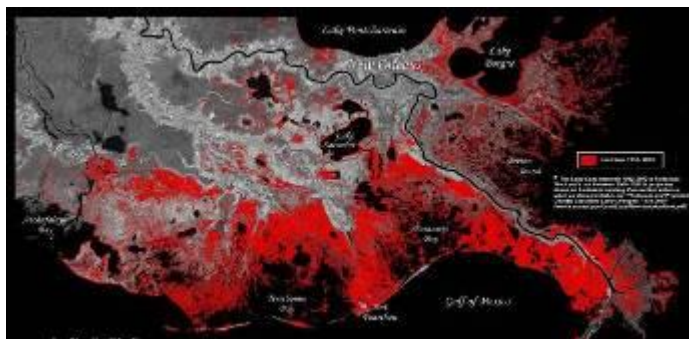
Coastal land loss is one of the significant environmental challenges faced by southeastern United States. In the US, Louisiana contains approximately 40 percent of the wetlands in the country (Department of Natural Resources (DNR) 2008). These wetlands are in peril, as noted in Couvillion et al.'s land change analysis (2011), indicating that coastal Louisiana has undergone a net loss of about 1,883 mi<sup>2</sup> in the wetland area from 1932 to 2010. The net change in land area amounts to a decrease of about 25 percent of the 1932 total coastal land area (Couvillion et al. 2011). Trends analyzed from 1985 to 2010 illustrate a wetland loss rate of 16.57 mi<sup>2</sup> per year (Barras et al. 2004). LA's coastline lost land at a rate of over 23 mi<sup>2</sup> per year in the 1990's, and the 2050 projection is that it will lose an additional area of approximately 500 mi<sup>2</sup> (Barras et al. 2004).

It should be noted that much of the above-mentioned loss does not occur annually but rather in spurts caused by severe weather events. After the landfall of Hurricane Katrina (August 29, 2005) and Rita (September 24, 2005), the open water areas in coastal Louisiana increased by 217 mi<sup>2</sup>, indicating a sudden loss of wetlands as a result of the storms (Barras 2007). Out of the total land loss of 217 mi<sup>2</sup>, 82 mi<sup>2</sup> of new open water area caused by Katrina were in the area



surrounding the Mississippi River Delta, Breton Sound, Pontchartrain and Pearl River basins. Approximately 117mi<sup>2</sup> of new open water area caused by Hurricane Rita was in the Calcasieu/Sabine, Mermentau, Teche/Vermilion, Atchafalaya, and Terrebonne basins. About 18 mi<sup>2</sup> of new open water area was created in the Barataria basin alone due to both the above-mentioned Hurricanes (Barras 2007). Figure 3.1 illustrates the historical and projected land loss in the southeast Louisiana. Projected land loss is calculated by studying the historical land loss trend in the area and with the assumption of no future restoration.

**Figure 3. 1 Historical and Projected Land Loss in Southeast Louisiana (1932-2050)**



Source: USGS, July 2005

### *Coastal Land Loss in the Plaquemines Parish*

In this research, Plaquemines Parish has been chosen as a case study location because of the substantial land loss in the past few decades. Located in the southernmost part of Louisiana, the Parish is a 90-mile long peninsula that stretches out from the southeastern portion of Louisiana as the Mississippi River spills into the Gulf of Mexico (Figure 3.1). The topography of Plaquemines has been extremely critical to its existence. Ground elevation ranges from 12 feet on the natural levees of the northern part of the Parish to below sea level in the swamp and marshes abutting the Gulf of Mexico. Due to low ground elevation in most of the Parish, high tides and sea level rise of a few inches can result in severe flooding and property damage. Shallow offshore depths and shoreline shape also contribute to storm surge buildup that can result in excessive flooding in the region.

Literature indicates that more land has been lost in Plaquemines when compared to other neighboring parishes, mainly because much of the Parish is outside the federal levee protection system. Figure 3.2 illustrates the Greater New Orleans Hurricane protection levee system (bordered in red) in New Orleans Metropolitan Statistical Area (MSA).

**Figure 3. 2 Existing Levee System in Plaquemines Parish**



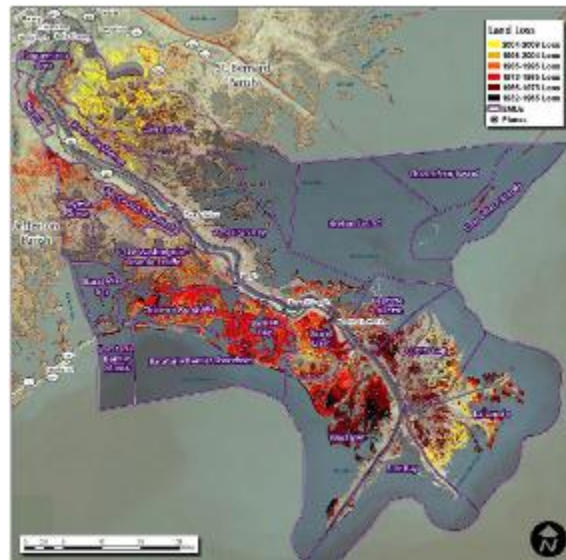
*Source: USACE 2007; Parish Comprehensive Master Plan*

In the Figure 3.2 above, it should be noticed that the east bank of Mississippi River is largely without any federal levee protection. Orleans Parish was able to withstand the onslaught of Hurricane Isaac in September 2012 primarily due to the city's strengthened flood defense system (built after the 2005 Hurricanes), which included walls, floodgates, levees and pumps. Whereas, in the same 2012 hurricane event, low-lying Plaquemines Parish had flood water overtopping an eight-foot-high levee between Braithwaite and White Ditch districts. Apart from Hurricane Isaac damages, scientists estimate that Hurricane Katrina alone transformed about 40 mi<sup>2</sup> of land into open water in the upper Breton Sound area (Barras 2007) (see Figure 3.3). The Breton Sound basin is located in the Plaquemines Parish and bounded by Breton Island on the south and the Chandaeleur Islands on the east. Impacts of hurricane events on Plaquemines Parish's land area are discussed in detail later in this chapter.

Ironically, the environmental conditions and location that make this Parish thrive also make it susceptible to natural disasters such as Hurricanes, storm surge and shifting of the

Mississippi delta. Therefore, preserving the human-made environment has been a continuous battle for this Parish.

**Figure 3.3 Plaquemines Parish Land Loss (1932-2009)**



*Source: USACE 2007; Parish Comprehensive Master Plan*

Rapid coastal land loss in Louisiana and Plaquemines Parish is occurring due to multiple reasons. Detailed discussion of the major causes can be found in Appendix A of this document.

## Chapter IV

### Literature Review

The literature review conducted for this thesis is divided into three sections. In the first section, I attempted to discuss intergovernmental coordination and conflicts in environmental resource management in the United States. The conflicts are caused due to the presence of multiple agencies and range of policies at all levels of government. To understand the mechanism of environmental resource management further, I reviewed the literature on the need for collaborative governance<sup>1</sup>, in the diverse coastal restoration policies, strategies, cooperative frameworks, that have emerged to address various environmental and coastal issues. Study of intergovernmental conflicts and coordination, therefore, provides a basis from which to resolve the research questions posed on efficient practice of adaptive management adequately. It helps me emphasize how integration of adaptive management is an influential method in gaining insight into the fast-changing ecosystem and accommodating changes to improve environmental and coastal resource management. Discussion in this section, thus, highlights how having collaborative governance can result into sustainable decision-making and effective adaptive management for coastal zone planning.

Following the review of collaborative governance and adaptive management, a thorough study of coastal restoration plans, that emerged as a response to accelerated land loss in Louisiana post 2005 hurricanes (at all levels of government), is performed. Review of the existing plans and plan foci helped me gain understanding of the intergovernmental and interagency functioning. Critical coastal restoration plan focus areas are typically wide-ranging, depending upon the size of projects that occur at the state and local level. To negotiate the breath and complexity of the number of total plan foci, I selected the following four areas: 1) coastal water resource management, 2) coastal land use planning, 3) dredging and diversion and 4)

---

<sup>1</sup> Collaborative resource governance is oftentimes defined as a group of diverse stakeholders that includes resource users and government agencies working in collaboration to resolve a shared public problem (Gerlak and Heikkila 2006)

funding and implementation of coastal projects. These four areas are chosen for intergovernmental relationship study because of the following reasons:

1. Each focus area involves the state, and the local government in the coastal resources decision-making process;
2. Growth has occurred in both land-oriented development (real estate, canals, ports, refineries) and water oriented activities (on and offshore facilities, fisheries, and navigational waterways) throughout the Gulf Coast. The existing land and water resources required to accommodate this growth is very limited, therefore, the shortage has resulted in conflict among competing uses (Hershman and Folkenroth 1975). Agencies who manage these resources have the potential to disagree with each other;
3. Federal funding for implementation of plans is limited compared to the number of existing plans in this region. Therefore, an analysis of these four components is useful in studying the intergovernmental functioning.

Finally, the third section in this chapter concludes with identifying the gaps in the existing literature and restating the research questions.

#### *Environmental Resource Management and Collaborative Governance*

The movement of environmental protection has enjoyed broad support in the United States for the past five decades (Sale 1993). Sale's 1993 study of the environmental movement identified at least 12,000 grassroots groups, 150 major nationwide organizations and a total budget of over \$600 million a year with considerable political influence at all levels of government. The presence, of a large body of environmental law at the federal, state and local level, has always caused intergovernmental tension. According to Kincaid (1996), the environmental laws, like Congressional mandates and the federal administrative rules that are promulgated to implement those mandates, are the causes for intergovernmental conflicts. The diversity of rules and standards, embedded in these environmental laws, poses intergovernmental coordination challenges (Kincaid 1996).

Having intergovernmental coordination by all means is extremely challenging when it relates to environmental resource and coastal zone management. The intergovernmental dimension of environmental management for countries such as the United States, New Zealand or India, which have multi-tiered governance systems, was not fully developed until recent decades (May et al. 1996). However, it started gaining importance with the passage of CZMA in 1972. Burby and May (1998) discuss that in a multi-tiered governance system, the structure often ends up being that of a shared governance of land and water resources. In the United States, although local government protects the sensitive ecosystem on state government's direction, it often finds federal and state requirements to be overly prescriptive and coercive. Local plans and sustainable growth ideas related to environmental management oftentimes have the potential to fail due to the inability of the higher-level government to fund the cost of implementation and lack of flexibility in the action required. Therefore, this results in reluctance, on the part of local government, for any intergovernmental arrangements.

Intergovernmental partnership, between state and local government for environmental management, involves a lot of disagreement regarding the appropriateness of controls over land use for environmental purpose. Therefore, Burby with Dalton (1994) and later again with May (1998) note that cooperation of local government is essential to institute development regulation control over the local land use. An example of such control is state official's facing pressure to address environmental degradation resulting from development, and, as a result, asking for local governments' help to undertake management of local environmental resources. In contrast, the local government typically faces strong pressure to promote the development rather than restricting the same to restore environmental quality (Burby and May 1998). In the case of Louisiana, petroleum extraction and oil refining activities form the basis of economic prosperity. As a result, the state government faces developmental pressure to accommodate expanding population and to increase the economic benefit for the area. The variation of pressures on each level of government results in differences in state to mandate management and environmental control to local government. Koontz (2005: 260) notes that "government and citizens have sought, through land use planning, to combine the interests and insights of multiple stakeholders

to develop plans for watershed management, habitat protection, farmland preservation, and other purposes.” Land use plans can stop or restrict development in high hazard area, thereby reducing the scale of disasters and protecting the environment. Land use planning also identifies the most-appropriate use of land, raises public awareness about hazards and increases the priority of hazard mitigation.

The approaches, that are most often adopted by local governments, to limit development in a hazardous area are: 1) prohibiting development in high hazard area; 2) use low-density zoning to limit development, 3) use density bonuses, 4) use tax incentives and 5) use transfer of development rights (Koontz 2005). Below are some of the main challenges to effective intergovernmental coordination (Koontz 2005):

- i) Recognition of conflict between layers of government produced by restrictive mandates;
- ii) Demands of local government for flexibility in decision making;
- iii) There are fewer directives and funding from the higher-level government agencies on how to balance environmental management and land use.

Resolving above-mentioned challenges and complying with the higher-level policy aims can result in sustainable policy making process. Therefore, it is important to investigate each plan component that affects successful implementation of the restoration policies.

#### *Need for Intergovernmental Coordination in Coastal Policies*

Achieving cooperation and integration between all levels of government is typically cumbersome and requires effective leadership and timely financing. While this study is expected to facilitate understanding by examining intergovernmental cooperation and coordination, it should also be considered an initial step towards the investigation of intergovernmental

relationship in the case study area. Following are the key reasons for a multiple, integrated governmental approach:

1. Coordination between federal, state and local government is required because they have different management objectives for utilization of resources and different mission concerns regarding the development and protection of the coast (Hale 2000). Federal government is mainly concerned about issues relating to national importance (e.g., fisheries, oil and gas industries, ports etc.) whereas state and local government are more concerned about local issues; such as population and economic growth, local ecosystem and related industries;
2. Intergovernmental coordination is required in order to identify and resolve incompatible goals, objectives, policies and development proposed in local government land use plan (Jessen 2007). Ability to achieve intergovernmental coordination is necessary to determine and respond to the needs for a coordination process with neighboring local governments and state agencies (Hale 2000);
3. Review of literature illustrates that different levels of government can initiate coastal management programs independently. Therefore, intergovernmental coordination is required to increase the effectiveness, efficiency, and responsiveness of government when these various programs are initiated. Such coordination provides consistency in decision and action between various department and agencies. It also improves citizen awareness and participation (Jessen 2007);
4. Coastal land use plans provide a foundation for parishes or counties to get involved in the permitting programs administered by a variety of regional, state, and federal agencies. The parish/county has a very strong standing as an affected party, and may provide comments to the various agencies that participate in the permitting program. This procedure allows for a thorough review of permit applications and also ensures that local issues are addressed to the greatest extent allowed through the specific permitting



process. It can only be practiced when all levels of government coordinated with each other.

### *Evolution and Role of Adaptive Management*

It is important to focus on an alternative form of efficient natural resource management known as adaptive management. Adaptive management can be defined as a process for continually improving management policies and practices by learning from the outcome of previously employed policies and practices. It was first popularized with the release of Hollings's (1978) book *Adaptive Environmental Assessment and Management*. Publications of other researchers (Stankey, Clark, and Bormann 2005) further legitimized the concept of continuous updates and adjustment to knowledge and management strategies, also described as "adaptation." It is a concept or management technique where each action is viewed as an opportunity for learning. The three important processes of adaptive management described by Folke et al. (2005) are participation, collective action and learning.

A critic of adaptive management might challenge the concept of adaptive management to be similar to or a variant of Lindblom's (1959) disjointed incrementalism or, as commonly described, "muddling through" model. It is viewed as "gradualism," meaning to take baby-steps towards the decision-making process. But adaptive management has demonstrated an ability to build on previous actions and outcomes; policies are always subject to revision in the light of past performance (cited in Stankey, Clark and Bormann 2005). Therefore, Lindblom's incrementalism is different from adaptive management on the grounds of purposefulness and the set goals and objectives that provide a basis against which progress and lesson gained can be measured (Folke et al. 2005).

Initial efforts in implementing adaptive management in Louisiana were conducted by the US Army Corps of Engineers (USACE) in the mid-1990s. The first adaptive management strategies were implemented to study the effectiveness of river diversions at Caernarvon (1991) and Davis Pond (National Resource Council (NRC) 2004). These projects were monitored to

determine the effect of salinity distribution. According to the literature, analyzing the monitored data of the Caernarvon Diversion helped in realizing the significant restoration benefits that could be achieved through pulsed releases lasting several weeks while avoiding undesired salinity lowering on oyster grounds lower in the estuary (NRC 2004). These structures are currently being used only with closely monitored experimental releases and an adaptive management framework. Another example of adaptive management is the LCA Study. The study/plan is explicitly applying adaptive management, within the USACE existing authority, as a means of refining the design and operation of specific coastal restoration projects by following “learning by doing” concept. An adaptive management approach is particularly suited to the emerging strategy because of the multiple but similar water diversion and control components that are being considered. It is appropriate also because of the uncertainties involved not only in project performance, but in other important variables (e.g., variations in river flow, impacts of hurricanes, etc.). The argument, therefore, is that adaptive management would constitute a more effective, coordinated and sustainable form of governance for management of coastal resources in Louisiana. Applying collaborative governance (through intergovernmental coordination) to the practice of adaptive management can aid or facilitate the overall process of environmental resource management in the coastal zone.

### *Coastal Restoration Plans*

#### **Critical Federal Coastal Act/Plans**

##### *The Coastal Zone Management Act (CZMA): [1972]*

The Coastal Zone Management Act (CZMA) of 1972 was passed to meet “the challenge of continued growth in the coastal zone.” Research indicates that all 31 coastal states participate in the CZMP approved under this Act. According to the CZMA, each state is accountable for managing its own CZMP. Post-Hurricane Katrina, understanding the effective use of the Act by the state was a useful starting point to examine the policy outcome in protecting Louisiana’s fragile coastline.

It was not until 1960s that the Congress recognized decline in coastal resources and water quality to be a national crisis (Godschalk 1992, Jessen 2007). The crisis of coastal resource management led to the congressionally established “Stratton Commission.” On realizing that the country was not making the most of its coastal opportunities, the commission was charged with the responsibility of investigating and suggesting an overall plan for national oceanographic/coastal program. Overall, the commission was charged to make recommendations on the “full and wise use” of the marine environment. The Stratton Commission (1969) also recognized through the final report “*Our Nation and the Sea: A Plan for National Action*,” that each state possessed the greatest amount of knowledge on natural resources and coastal development of their respective coastal area. Therefore, one of the primary goals of Congress through the CZMA [as noted in California Coastal Commission, et al., Appellants, v. Granite Rock Company (1987)] was to “enhance state authority by encouraging and assisting states to assume planning and regulatory powers over their coastal zones.” In other words, the federal government cooperates and delegates administrative and enforcement responsibilities of developing and implementing coastal plans and projects to the individual (voluntarily) participating states. The states participate by the development and implementation of state Coastal Management Program (CMP). The CMP is developed in coordination with federal, state and local agencies, impacted industries and other interested groups including citizens. The salient features of CZMA are as follows:

1. Federal government grants funding to the state for development of the state CMP;
2. All development plans/projects get approval from the National Oceanic & Atmospheric Administration (NOAA) and the Secretary of Commerce;
3. Finally, the states gain authority to utilize the consistency provision of the CZMA upon the approval of the plan.

### *What is Consistency Provision of CZMA?*

According to NOAA, federal consistency is a provision in the CZMA that requires the federal government to comply with the state CMP when taking actions that are likely to affect the state's coastal resources. The consistency provision also known as 'reverse supremacy' gives the state veto power over federal activities in the state's demarcated coastal zone.

Lowry and Eichenberg (1986) note that, CZMA appears to provide a mechanism to coordinate federal and state objectives in the coastal zone and outer continental shelf (OCS). Findings from their study suggest that the "Federal consistency provision has improved information available to state and significantly increased formal and informal intergovernmental collaboration in ocean and coastal management" (Lowry and Eichenberg 1986: 40). Although the Coastal Management Division (CMD) of Louisiana Department of Natural Resource (LDNR) is responsible for state compliance and exercise of authority granted by CZMA, many federally regulated activities (such as offshore oil, gas and mineral resource development, land and water resource management, river diversion projects, dredge and fill activities) have affected management of Louisiana's coastal resources greatly. Therefore, the size and scope of federal presence has always posed a dilemma to these coastal areas (Lowry and Eichenberg 1986). Findings from Martin's (1991) and Jessen's (2007) studies affirm that State of Louisiana has not been using federal consistency to its full capacity. They believe that aggressively using CZMA consistency determination power can provide solutions to problems related to coastal land loss.

To address and understand the inconsistency, it is important to recognize that although the state has veto power over the federal activities in the coastal zone through the consistency provision, it is also required to meet the expectations of the Congress. To understand the consistency provision further, defining all the federal activities that impact the coastal zone is useful. The two major categories of federal activities are; i) projects that are executed by federal agencies and ii) projects that require a federal license or permits. Eliopoulos, as cited in by Lowry and Eichenberg (1986), notes the following conflicts between federal and state government due to the consistency provision of CZMA:

The federal administrative agencies (Department of Interior) object to state control over various oil and gas permits and believe that CZMA and the federal consistency provision creates unnecessary regulatory complexity and delay in resource development;

1. When the state disagrees or intends to oppose a decision, it has to go through the Secretary of Commerce or judicial intervention to forbid federal activity. Therefore, it is time-consuming and cumbersome for both forms of government to get a project started;
2. Critics have argued that the consistency provision has a ‘reverse preemption’ effect by which the federal authority may be stopped by states from executing projects that promote national interest, as the projects are deemed not in line with states vision of coastal restoration. But not using the consistency tool also causes a policy divide between federal and coastal state priorities of shared ocean resources.

The divergent interests between federal and state governments also affect the efficiency of local government (Mcguire 2012). Divergence of interest between federal and state begins to occur when coastal states update the management plans to internalize the cost of climate change and sea level rise, with the idea of protection against any future circumstance events. Whereas the federal government adopts policies that are aimed at accelerating offshore energy development, especially those projects that are geared towards oil and gas production. The federal government’s recent policy to increase offshore oil and gas production, in many ways, is a political response to current economic conditions and a desire to increase energy independence. It presents a conflict with the evolving (sometimes divergent) policy directions of the federal government and coastal states when it comes to prioritizing and implementing coastal resource management policy. This conflict is compounded when one considers the overarching legal framework in which both the federal government and coastal states operate.

*Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) [1990]*

Decades before the CWPPRA was passed, coastal planning focused on addressing risk reduction, coastal restoration or only on specific areas of coastal Louisiana (Tidwell 2003, Jessen

2007). In 1990, when the US Congress passed CWPPRA, also known as the Breaux Act, it adopted a holistic effort of identifying, preparing and funding wetland restoration efforts across coastal Louisiana. CWPPRA developed a Task Force, which comprised of the state of Louisiana (local cost-share sponsors) and corresponding five federal agencies (federal sponsors) including United States Environmental Protection Agency (US EPA)/LA Department of Environmental Quality (DEQ), Fish and Wildlife Service (FWS)/LA DWF, National Resource Conservation Service (NRCS)/LA DNR, National Marine Fisheries Service (NMFS) and USACE. The Task Force provides direction and guidance to subordinate organizations through a Technical Committee (TC). Apart from the Task Force, CWPPRA created a Priority Project List, and a way to select CWPPRA restoration project for Priority Project List (PPL). Additionally a comprehensive “restoration plan” and funding scheme were also developed<sup>2</sup>. The purpose of the overall plan:

*“is to develop a comprehensive approach to restoring and prevent the loss of coastal wetlands in Louisiana [and] coordinate and integrate coastal wetlands restoration projects in a manner that will ensure the long term conservation of the coastal wetlands in Louisiana” (CWPPRA 303(b)(2)).*

As of July 2011 annual report, CWPPRA had 149 active coastal restoration projects and 91 completed projects that benefitted 112,000 acres of coastal land in Louisiana. Types of project eligible under CWPPRA restoration plan are:

- Freshwater/ Sediment Diversion;
- Sediment dredging;
- Barrier Island restoration/ shoreline protection;
- Vegetative planting;
- Hydrologic restoration;
- Beneficial use of dredging material;
- Sediment trapping.

---

<sup>2</sup> “The Restoration Plan: In November 1993, The Task Force completed the large-scale Louisiana Coastal Wetland Restoration Plan as required by CWPPRA.

Although CWPPRA has been fairly successful, it is also a largely underfunded plan. According to the CWPPRA Plan, the proposed projects will create or restore more than 74,000 acres of wetland over a period of 60 years (by 2050). However, without the necessary funding these projected gains are unattainable (Peyronnin et al. 2013). Further, the plan and projected gains were made prior to Hurricanes Katrina and Rita. Therefore, PPL; environmental conditions and cost effectiveness had dramatically changed by the time the recommended projects reached the implementation phase. It is also interesting to note that the coastal system in Louisiana does not recognize political boundaries; therefore, only giving dollars to individual parishes mean that large-scale restoration projects cannot be achieved. Apart from the cost effectiveness of the available funds, property rights issues and civil damages under Louisiana law posed major threats to CWPPRA projects.

Property right issues associated with coastal restoration have acted as a barrier to restoration activities (Herbert 1997). An example of such a conflict is the effect of a CWPPRA project on oyster production and the leases. Oyster production in Louisiana is a livelihood for many and is a significant industry in southern Louisiana. The majority of oyster production in Louisiana takes place on state-owned water bottoms, yet some production occurs on leased private water bottoms. Such oyster leases have delayed the freshwater diversion since the time restoration began in late 1980's in Louisiana (Herbert 1997). Introduction of freshwater and sediments to curb coastal erosion disrupts the degree of salinity in the water and effects the oyster leases.

According to an article by Marshall (2011), the 1983 opening of the Bonnet Carré Spillway caused fresh water to enter the oyster farms and resulted in 100 percent oyster mortality in certain areas. The main reason for the high mortality is the fact that oyster farms require a certain degree of salinity in the water, thus, as the state plan of freshwater diversion projects are proposed, legal problems in the areas of 'taking' laws and compensation rights arose with the

oyster farming. Therefore, because of the above three reasons and others, many of the CWPPRA projects have stalled or remain unauthorized.

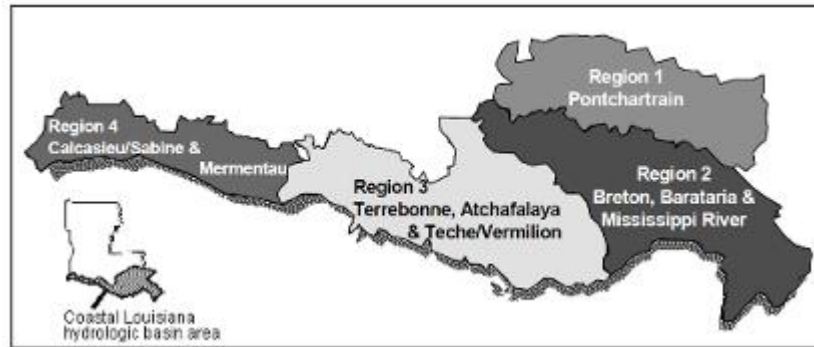
### **Critical Louisiana Coastal Plans**

#### *Coast 2050: Towards a Sustainable Coast [1998]*

As a result of delay and non-implementation of the proposed projects in the CWPPRA plan, the federal government and the state of Louisiana funded a new statewide coastal plan with a clear strategic vision, known as Coast 2050 (LCWCR Task Force 1998). Beyond CWPPRA, the state also needed to recognize and have a consent (through a federal, state and local partnership) on the need and desire for restoration of coastal ecosystems, even though specific strategies for achieving these objectives were unavailable. The mission statement of this plan called for a “technically sound strategic plan to sustain coastal resources and provide an integrated multiple-use approach to ecosystem management” (LCWCR Task Force 1998). Through the new plan, the state ensured that many of its priority CWPPRA projects could be built in a more efficient and timely manner. The new plan recognized the need to reestablish the natural geomorphic and ecological processes that have historically shaped LA’s coast. In an attempt to achieve the same, Coast 2050 focused on; i) establishing strategic statewide goals rather than committing to fulfilling a series of disconnected projects and ii) strategies based on a regional scale rather than the local scale. Coast 2050 divided southeast Louisiana into four different regions each having its individual local restoration and preservation objectives for the year 2050. The four regions were based on Coastal Wetland Planning, Protection and Restoration Act (CWPPRA) hydrological basins which are as follows i) Pontchartrain (Region 1), Breton, Barataria & Mississippi River (Region 2), Terrebonne & Teche/Vermillion (Region 3) and Calcasieu/ Sabine (Region 4). Each region measured its wetland restoration and preservation success depending on the following criteria; i) habitat objectives, ii) regional ecosystem strategies, iii) sequencing of regional strategies (near and long term objectives) and iv) local or common strategies.



**Figure 4. 1 Regions of Coast 2050**



*Source: Coast 2050 Report*

Although the plan focuses on the overall coastal land loss scenario, the objectives were developed in coordination with respective Parish governments, local coastal advisory committee, Louisiana Department of Environment Quality (LDEQ), EPA and other concerned agencies. Anticipated targets of Coast 2050 were as follows (LCWCR Task Force 1998):

Region 1: was expected to save 33,500 acres or 75 percent of the existing marsh across the region. It was also expected to offer extensive habitat diversity by providing good estuarine gradient.

Region 2: was expected to save approximately 189,900 acres of marsh thereby achieving no-net-loss. This region was also supposed to gain 51 percent more marshland. Hurricane protection levee parallel to Bayou Lafourche and Plaquemines Parish would be protected from marine forces by the adjacent preserved and replenished marsh. Also, LA Highway 1 would have been protected with a healthy marshland.

Region 3: estimates suggest there would be additional 119,600 acres of marshland and 46,700 acres of swampland.

Region 4: Close to 34,370 acres or 57 percent of marshland were projected to be saved. Salinity control projects planned for implementation in this area were expected to simulate historic estuarine gradient.

Figure 4.1 indicates Plaquemines Parish is located in Region 2, which has the maximum acreage of expected land saved with a no-net-loss strategy according to the plan. The approximate construction cost for implementing all of the planned regional ecosystem / land saving strategies was \$14 billion. This cost, however, did not include monitoring and cost estimates for any local or common strategies that may have arisen while implementing the projects (Reed and Wilson 2004, LCWCR Task Force 1998).

#### *Louisiana Coastal Area (LCA) [2004]*

LCA plan (2004) was completed six years later by the U.S. Army Corps of Engineers (USACE) and the LDNR. It was reviewed by NRC to operationalize the goals and objectives of the Coast 2050 plan. I have listed this plan as a state effort because of two reasons. 1) Although LCA was a federal program, the state was the local sponsoring partner. 2) A major part of the LCA plan was to focus on broad-scale restoration efforts to save the entire coastal ecosystem where state of Louisiana accounted for the most wetland area. The idea of statewide restoration was apparently first introduced by the state programs of Coast 2050. In order to achieve such coast wide restoration goal, it is imperative to evaluate specific restoration projects and techniques for future implementation. Most of the projects proposed by LCA were feasible from an engineering perspective, mimicking the natural coastal sediment loading system. However, the National Research Council expert committee (2008) recommended some suggestions to the plan. The proposed modifications were as follows:

- Generate maps of future landscapes for various time scales with alternative options for remediation. It will increase the capability to predict the effectiveness of future

restoration efforts and consequently this will improve the future monitoring of the wetlands and their response to remedial measures.

- For all the restoration projects in LCA, the committee recommended diversion of water and sediments to areas conducive for wetland development. In this approach, the finer sediments will flow to the west but the coarser sediments will have to be dredged from the riverbed to predominant placement to the west of Plaquemines parish levee (Evans-Graves Engineers 2013).

The Coast 2050 and the LCA study both required an estimated federal funding of \$14 billion over a period of 30 years for restoring the basins of Mississippi River and the Louisiana coast (Bordeau, English, and Pohne 2013). Records indicate that these plans never received funding by the federal government, in large part because the plan was released shortly before Hurricanes Katrina and Rita, which had a profound effect on how the federal government and state viewed coastal restoration projects (Tidwell 2003).

#### *Comprehensive Master Plan for Louisiana Sustainable Coast [2007]*

In 2007, the State of Louisiana produced the first statewide coastal restoration plan. The Louisiana Comprehensive Master Plan for a sustainable coast in 2007 (hereafter known as the “Coastal Master Plan”), was created by the Coastal Protection and Restoration Authority (CPRA). CPRA was formed under Act 8 of 2005 Louisiana Legislature’s First Extraordinary Session recognizing the critical need developed due to Hurricane Rita and Katrina. It directed the state to create a comprehensive sustainable plan for the entire coast with the intent of updating it every five years.

Planning effort through the Master Plan focused mainly on integrating coastal restoration to coastal protection (Peyronnin et al. 2013) This comprehensive plan acknowledged the need for communities to be able to recover from the damages of Hurricane Katrina and also adapt to the

changing coast. To achieve a greater level of resilience, this plan introduced the concept of ‘multiple lines of defense’ (Figure 4.2) that included both structural and non-structural methods to protect the Louisiana coast and the coastal communities. It means taking advantage of natural flood protection that is provided by existing marshes, ridges, barrier islands and forested wetlands. The plan was completed, using and building upon past plans such as CWPPRA, Coast 2050 and LCA.

**Figure 4.2 CPRA Multiple Lines of Defense Strategy in PPSIP**



*Source: Plaquemines Parish Strategic Implementation Plan*

*Coastal Impact Assistance Program [2007]*

The CIAP was authorized by Section 384 of the Energy Policy Act of 2005 (BOEMRE 2010). In the year 2007, Congress finally announced federal grant funds of approximately \$250 million through the CIAP to all eligible states and their Coastal Political Subdivision (CPS) over a period of four years (2007-2010). Along with Louisiana, the other states eligible for CIAP program were Alabama, Texas, Mississippi, Alaska and California and their individual parishes or counties. The main purpose of the program was to provide federal assistance to all oil producing states and local counties to stabilize their coastline and mitigate the effect of OCS oil and gas exploration. Listed below are the main objectives of the plan:

- Projects and activities for the conservation, protection, or restoration of coastal areas, including wetland;
- Mitigation of damage to fish, wildlife, or natural resources;
- Planning assistance and the administrative costs of compliance;

- Implementation of a federally-approved marine, coastal, or comprehensive conservation management plan; and
- Mitigation of the impact of Offshore Continental Shelf activities through funding or onshore infrastructure projects and public service needs (BOEMRE 2010).

Louisiana is one of the six states and Plaquemines, one of the fourteen coastal parishes in the state, to receive a fraction of the funds over a four-year period. For Plaquemines Parish, the federal fund through CIAP is too little to address the devastation caused by Hurricanes Katrina and Rita. Monies received through CIAP are partially used in funding \$2.4 million shoreline protection project near Buras Marina (Hahn 2013). Mississippi River Long Distance Sediment Pipeline project is another restoration effort by Jefferson-Plaquemines Parish, where CIAP funds have been used.

*Louisiana's 2012 Coastal Master Plan [2012]*

Post-Hurricanes Katrina and Rita, Congress failed to approve state requests for emergency funds to address storm damages to the Louisiana coast. While previously funds had been denied for lack of a comprehensive plan, the lack of funding for restoration was attributed to the lack of an annual plan of actions and expenditures that stated how the awarded funds would be utilized in specific coastal restoration projects. Therefore under Act 8, CPRA was responsible not only for updating the 2007 Coastal Master Plan, but also developing an annual plan of action and expenditure for submittal to the legislature at the end of every fiscal year. The updated Coastal Master Plan is a 50-year comprehensive coastal restoration and hurricane protection plan to rebuild the land and protect communities from future storm surges (CPRA 2012). It is also the culmination of all other previous plans such as CWPPRA, LCA and Coast 2050.

By utilizing inputs from various stakeholders, coastal planners, engineers and coastal science experts, the overall purpose and approach of the plan were developed. The primary objective of the plan is to recommend a list of coastal restoration priority projects which the state

should fund first. It discusses the expected outcome of these projects and their effect on the coastal system to set precedence for the future projects. Recent study indicates that CPRA developed a decision-making process which ensures that the 2012 Coastal Master Plan relied on science and technical information (Peyronnin et al. 2013). The decision-making process includes integrated modeling, decision support tools (also known as CPRA planning tools) and extensive public outreach programs.

Although the Coastal Master Plan received strong public support and passed the Louisiana legislature unanimously in 2012, it faced challenges in financing the restoration projects. CPRA anticipated the BP Deepwater Horizon spill fine money for implementation of coastal restoration projects, which the state will receive piecemeal and at an undetermined time. Therefore, the plan was eventually critiqued because a long term implementation plan could not be realized without a direct funding source.

### **Critical Plaquemines Parish Coastal Plan**

#### *Plaquemines Parish Comprehensive Master Plan [2013]*

In order to understand the coastal restoration planning efforts at the Parish level, this thesis first reviews the Plaquemines Parish Comprehensive Master Plan (2013). The primary goal of the Comprehensive Master Plan is to establish a framework for Plaquemines' sustainable growth and development. The Master Plan, with the help of a local perspective, analyzes a variety of planning elements that influence future development. Out of several plan elements, this study particularly focuses on two major plan elements of the Plaquemine Parish Comprehensive Master Plan: i) The coastal restoration and protection element and ii) the land use element. Although the Comprehensive Master Plan was reviewed and adopted in 2013, the subcommittee reviews and updates priorities and action plan to keep pace with the new needs.

*Coastal Restoration and Protection Element:*

The coastal protection and restoration element of the Master Plan serve as a framework to guide future restoration activities in the parish. It is organized into three major sections discussed below (Parish Master Plan 2013):

- Coastal Restoration Element of the Community Assessment:
  - i) This section discusses the coastal restoration objective and policies which focus on; i) the importance of sustainable coastal restoration, ii) lower advisory base flood elevations (ABFE), iii) facilitating joint project development with CPRA and the USACE.
  - ii) It also notes that the Plaquemines Parish coastal restoration plan centers upon the multiple lines of defense approach; a strategy that is adopted by the State of Louisiana and USACE. The major emphasis of the Parish plan is to use the Mississippi River sediments to rebuild wetlands and marsh barriers in conjunction with a structural flood protection system. The overall plan is to evaluate the impact of the proposed restoration projects on a regular basis so that future actions can be calibrated according to the needs of the Parish.
  - iii) Evaluation of the coastal restoration and protection plan through Federal Emergency Management Agency (FEMA) and USACE-approved computer models to determine ways to optimize storm surge reduction capabilities of various restoration features.
- Future Issues and Needs (Parish Coastal Master Plan 2013)
  - i) Sediment

In order to implement large-scale restoration in the Parish, the wetlands will require a constant flow of riverine sediments. Conventional dredging method will not be able to supply a sufficient quantity of dredge material to the project sites efficiently (Parish Master Plan 2013). Proposed cutterhead dredger, on the other hand, is a more efficient dredger however; it has potential to affect channel navigation in the lower Mississippi River;

ii) Computer modeling

Plaquemines Parish and the US ACE signed a memorandum of cooperation to conduct storm surge modeling to evaluate the effectiveness of the existing coastal projects in conjunction with the flood protection levee. The aim and need is to have each sub-management unit focus on optimizing project clusters to achieve the most reduction in Base Flood Elevation (BFEs);

According to the Parish Master Plan 2013, computer modeling should not only analyze the sediment during the project construction but also calculate the supply of sediment quantities that is needed to sustain the marsh over a longer period of time.

iii) Determination of the appropriate level of flood protection

Flood protection structures and coastal restoration projects are designed to achieve certain protection goals. The first objective is to have 100-year flood protection as the performance criterion in design and management of the restoration structures in Louisiana. The second objective in the Parish Master Plan is to have category 5 level hurricane protection. The two ratings are different and cause conflict in establishing a consistent standard to represent storms.



iv) Funding

There is a need for maintaining consistent funding revenue in order to have successful coastal restoration in the Parish. It has been observed in the past that large-restoration projects have been delayed due to lack of consistent funding. Since many restoration projects are interrelated, delay in implementation of one project may undermine the performance of other ongoing restoration projects. All the coastal parishes compete for a limited amount of grant money for restorations programs. Therefore, it is a Parish need to continue close coordination with state and federal governments and simultaneously collaborate with regional programs.

- Policy Recommendation for coastal protection and restoration (Parish Master Plan 2013)

i) Intergovernmental cooperation and cost-sharing are essential.

The Parish needs to continue close coordination with state and federal agencies for planning and constructing restoration projects. It is also imperative for the Parish to seek opportunities to partner with other coastal Parish and regional organizations for cost-sharing.

ii) Continue efforts to federalize back levees

According to the Parish Master Plan, the back levees in Plaquemines Parish should be built in association with other projects to create multiple lines of defense. Raising back levees for 100-year flood protection would be a cost prohibitive project for the Parish to perform alone. Therefore, federal participation in the cost is essential.

iii) Continue to seek BP money for restoration

Plaquemines Parish should continue to seek numeration for funding for coastal restoration and coastal protection projects.

iv) Maximize performance of non-structural measures

Reducing flood levels measures measured by ABFEs is the only way to ensure safety and affordability of housing in Plaquemines Parish. Apart from just relying on levee protection, it is essential to adopt an integrated system of levees, coastal diversions, forested wetlands and freshwater diversions to form a stronger protective barrier than the levees.

v) Balance and implementation of large and small restoration projects.

Large-scale coastal restoration projects are crucial to long term sustainability of the Parish. On the other hand, the smaller projects act as a band-aid program providing immediate relief and stops ecosystem degradation in a short time. Assessment of the Parish restoration programs revealed that the long term and short-term projects are both interrelated to each other. It has been observed in the past that delay and failure to implement large-scale projects may undermine the performance and endurance of the small projects that bear regional implication.

vi) Proactive risk management and communication.

After each flood/storm surge event, it is important for the government to have a modest investment to improve the flood control structures that aims at reducing immediate risks. Such investments to repair and improve flood defenses ultimately prompted residents to return and make additional investment in partially protected floodplains causing more people and properties to live and exist on harm's way.

- Recommended Implementation strategy (Parish Master Plan 2013)

This section discusses two types of implementation strategies to provide 100-year protection to the entire Parish by building levees.

i) Levee implementation

There are extensive levee systems in the Parish. Unlike other coastal parishes, Plaquemines is bordered by levees on all the sides. The back levee, also known as hurricane protection levee, provides protection against storm surge and wave actions. The river levees that are owned by the USACE have gone through repair and enhancement project post-Hurricanes Rita and Katrina. Many non-federal levees (back levee or hurricane protection levees) are now scheduled to be federalized to promote compliance with federal flood control requirements and coordination of maintenance.

ii) Coastal restoration with Multiple Lines of Defense

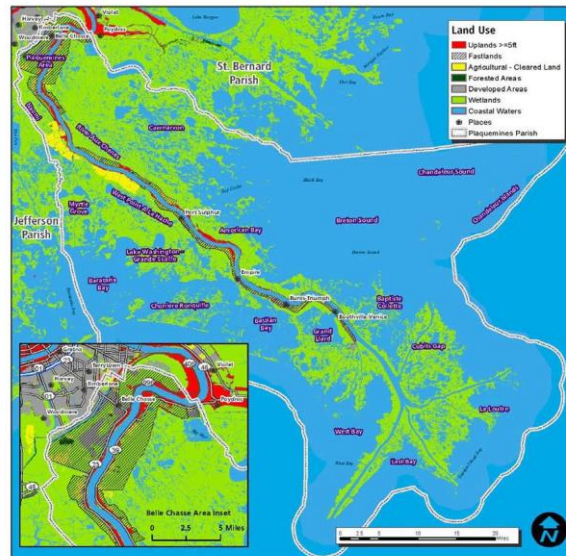
Apart from effective management of Mississippi River sediments for marsh creation, Plaquemines' local restoration planning effort involves the strategy of multiple lines of defense. For the planning purpose the Parish is divided into four major environmental zones i) Fastland, ii) Upper delta, iii) Middle delta and the iv) Balize delta. The PPSIP identified specific management strategies for each of these environmental zones based on the concept of multiple lines of defense.

*Land use element:*

Land use is also an important element in the Plaquemines Parish Comprehensive Master Plan with regards to coastal restoration efforts. Parish's unique geography and environmental conditions post-Hurricane Katrina and the subsequent BP Oil Spill make land use an important factor for coastal restoration. Both of these events caused significant changes in human and physical environment of the Parish. The assessment of existing land use in the Master Plan indicates that the parish has 3% land area that is developable (Plaquemines Parish 2013).

Developable land is a thin strip of land located between the Mississippi River and the back levee (not federally owned). Federal hurricane protection levees built to protect the Parish from storm surge also have certain unintentional consequences. First, the precipitation within the levee protected area cannot naturally drain and gets collected or trapped due to the very levee systems which are intended to protect the Parish from flooding. During heavy rain event, water can potentially quickly collect and overwhelm the storm water drainage infrastructure thereby leading to localized or widespread flooding of neighborhood. Secondly, the levees also prevent natural spring flooding from the Mississippi River into adjacent marshes, thereby depleting the area of the nutritious sediments that are vital to the growth of coastal wetlands.

**Figure 4.3 Land Use Map of Plaquemines Parish**



*Source: Parish Master Plan*

Therefore, the Plaquemines Parish Comprehensive Master Plan focuses on future land use needs like storm water management regulations, extension of sewer service to support development & water quality, development of important port facilities, etc. The big questions surrounding land use are related to the Parish’s zoning, subdivision and other development codes, which need to be updated in order to implement the future land use plans developed for the Parish. Apart from that, the plan also discusses how adaptation of FEMA’s National Flood Insurance Policy (NFIP) will bring changes in ABFE for new and rebuilt structure in the parish. Such efforts through the Plan would eventually lead to the discussion of opportunities that are available for developing affordable housing in the area.

*Coastal Zone Management Program (CZMP) [2000]*

The Coastal Zone Management Program was first approved by Plaquemines Parish Council in the year 2000. It is to be noted that this plan was produced under CZMA and the program was developed with the input of the Coastal Zone Management Advisory Committee that is comprised of representatives of the citizens and special interest groups, parish administrative personnel and the public. It serves the objective of defining the Parish's role in the decision-making process regarding the uses and activities affecting the coastal resources (Evans-Graves Engineers 2013).

This plan provides an overview of the physical, cultural and socio-economic condition of the parish. It also identifies the environmental and socio-economic conditions that could potentially result in resource use conflicts. As mentioned in the previous chapter, subsidence, land loss and its effect on ecosystem habitat are the three major environmental problems leading to resource use conflict in the Parish. Major uses of coastal resources include: i) fresh and estuarine water for commercial and recreational fishing, ii) wetlands and water bodies for trapping and supporting sensitive ecosystems, iii) navigable water for commerce and recreation and iv) oil/gas/other mineral extraction, v) fisheries, etc. Environmental degradation and conflict among users has arisen and impacted the coastal areas over the past few decades. According to the CZMP, conflict arises when one person's uses interfere with another person's uses of the same resource or in situations when actions taken to resolve existing environmental problems impact the use of existing resources in a short-term or long term basis. One such recent example is how the oil/gas industry and the oil spill have impacted water and wetlands quality, and ultimately impacted fisheries. Identifying these conflicts can be helpful in developing restoration policies that could provide guidelines for decision-making on local coastal use permit.

*Plaquemines Parish Strategic Implementation Plan (PPSIP) [2008]*

In 2008, the Plaquemines Parish Strategic Implementation Plan (PPSIP) was prepared by Coastal Environmental Inc. in collaboration with Louisiana Water Research Institute and Louisiana State University (Gagliano et al. 2008). The rationale behind this plan was to develop strategies that would help in achieving sustainable coast. It mainly focused on first, protecting citizens and property owners from storm surge, second, maintaining the economic base and third, restoring the Parish's unique culture. The coastal restoration strategy of PPSIP is also based on multiple lines of defense strategy (Figure 4.2) outlined in the State of Louisiana Coastal Master Plan (2007). Another key component of PSSIP is to use computer models to evaluate the individual coastal restoration projects from the storm surge reduction (Gagliano et al. 2008). Development and implementation of this Plan involves six strategic elements: i) Use of Mississippi River sediments, ii) Diversions, iii) Collaborative and Coordinated Restoration Activities, iv) Storm Surge Modeling, v) Restoration Implementation Scenario and vi) BFEs Maps.

PPSIP divides the Parish into four main environmental management zones (Figure 4.4) to achieve efficient planning strategy implementation. The different management zones are:

1. Fastland: The land that is confined between the Mississippi River levees and backside hurricane protection levees.
2. Upper Delta: It is located on both sides of the fastland corridor. It is the natural levee caused by the switching of the Mississippi River channel over time.
3. Middle Delta: It is part where the natural levees are supplemented by engineered structures. This area is characterized by narrow natural levees and fringing marshes.





challenges that may arise due to intergovernmental conflicts and coordination in the respective plan element.

### ***1. Coastal Water Resource Management***

The United States has faced strains and stresses in intergovernmental relation pertaining to coastal water resource management (Gerlak 2003). According to the existing literature, the nature of the relationship between federal-state-local governments, in terms of water policy, has evolved over time. There has been consistent conflict between federal policy and local interest for water resource projects (Mcguire 2012). For instance, the federal interest has typically favored projects with traditional economic benefits more than restoration focused-benefits (US Fish & Wildlife Service, 2005).

#### *Historical Perspective*

The history of the federal government relationship with the state and the local government pertaining to water resource management is of an evolving nature. The dynamic intergovernmental relationship is divided and described in the following three major eras (Gerlak 2003: 234-240):

i. Era of State-Based Federalism (late 1700's to early 1900)

In this era, issues related to canal building and flood control were dealt by the state and federal government. Although the federal government was active, it had played a very small role in the decision-making process.

ii. Era of centralized federalism (1900-1960)

In this era, the federal government became a “dominant party in the American government system.” Centralized federalism was characterized by federal governments increased role in water resource management.

iii. Era of cooperative federalism (1960's-1980's)

This era was marked by a shared federal-state authority over water resource management. It also marks the establishment of Clean Water Act (CWA) that was the first environmental law to place a heavy burden on the local government. In other words, state and local action was subjected to federal control.

*Present Condition*

The present condition is characterized by expanded federal authority and increased state capacity combined with a rise of local groups and greater ecological concern. It is known as the era of collaboration and restoration (Galloway 2006, Jessen 2007). This era's marked characteristic is an integrated environmental management approach (shared power between state-local governments), which has a "watershed" and "no-net-loss" wetland policy approach. A watershed approach advocates control of various non-point sources of water pollution that involves different levels of the same government. No-net-loss government policy means that there is no overall loss in the nation's remaining existing wetland base. It however allows the government to develop certain existing wetlands if the loss is offset by development or restoration of wetlands in another location. Some of the key benefits and challenges from intergovernmental coordination and intergovernmental conflicts in water resource management are summarized below in Table 4.1.

**Table 4.1 Intergovernmental coordination and conflicts in Water Resource Management**

<b>Benefits of Intergovernmental Coordination in water resource management</b>	<b>Challenges from Intergovernmental Conflicts in water resource management</b>
Collaborative partnerships of shared power and collaboration between all levels of government results into pooling of knowledge and resources regarding water management (Jessen 2007, Gerlak and Heikkila 2006)	The policies' ability to address watershed's ecology specific issues are questionable (Galloway 2006).
Relies on adaptive strategies with a focus on resolving watershed management issues (Mcguire 2012)	Coordination between stakeholder and the coastal restoration program activities is difficult to attain (Hershman 1975);
	Stringent water management regulations are cost prohibitive for states to fund. It makes the state dependent on federally funded loan programs. These loan programs often face a backlog for approval of a particular project thereby leading to delay in project execution (Galloway 2006)

## ***2. Land Use for Coastal Restoration***

The state does not mandate land use planning in Louisiana. However, the state created enabling legislation in the 1920's that allows planning to happen – and then devolved the responsibility to local government if they so choose. An increasing number of states passing legislation mandating the local government to prepare plans have been noteworthy. States regularly encourage local government to plan for environmentally responsible growth. These make land use planning critical especially in the sensitive coastal area (Kusler 1980, Berke et al. 1996). According to Kaiser and Godschalk (1995), the five specific types of authority which the local government has (including that of LA) are i) planning, ii) regulatory control, iii) spending, iv) taxing and v) acquisition of property. These powers, however, can be put to use when the local government has “home rule powers” meaning that the local government has a high degree of autonomy and freedom to exercise the above-mentioned powers. Therefore, it is important for the policymakers to be cognizant of any such limitations and take appropriate steps in this regard.

### *Historical Perspective*

Comprehensive Planning is an instrument for land use regulation and growth control. Hanushek and Quigley, (1990: 176) identify land use regulation as significant market intervention taken by state and local government. Since there are no federal land use laws, land use planning mainly occurs at the state and local level. At the local level coastal land use, planning is undertaken both at the community level through land use planning and through statutes such as CZMA and Coastal Barrier Resource Act (CBRA). While planning is happening at multiple scales, these plans are often uncoordinated and encourage conflicting types of development (e.g. conservation areas also proposed as new residential areas). However, according to some scientists like Platt (2004) and Saikku (2006), the federal government began to take a much larger role after the Mississippi flood in 1927, and subsequent devastating storms (namely Hurricane Betsy in 1965 and Hurricane Camille in 1969). As a result of severe loss of life and property in each of these events, the federal government shifted its role from a hands-off risk avoidance approach to an active risk reduction and risk sharing approach that had a profound effect on the coastal zone development. It was believed that hazards in these coastal zones could be eliminated through engineering and that the federal government had a responsibility to bail out businesses and citizens in the event of a flood disaster. Eventually, this shift in policy at federal level not only reduced financial risk but also facilitated the development of thousands of acres of property in hazardous coastal areas.

### *Present*

Following the passage of a significant number of intergovernmental growth management regulations in the 1960's and 70's, few regulations have been passed which require local governments to adhere to state-mandated land use requirements (Weitz 1999). The present situation, whereby federal policy encourages the development in hazardous areas, with few limits on the zoning or building codes of these areas, is generally the norm in the US. According to Burby and May's study (1998), the per capita insurance rate in Florida is much less than the

other states because of the stringent building standards and zoning laws in the coastal zone required by state-mandated growth management

**Table 4.2 Intergovernmental coordination and conflicts in Land Use Planning**

<b>Benefits of Intergovernmental Coordination in Land use and mandated Planning</b>	<b>Challenges from Intergovernmental Conflicts in land use and state-mandated planning</b>
<p>Building Codes: Louisiana has state-mandated building codes (for all municipalities) both for residential and commercial buildings with specific requirements for parishes in coastal and high wind hazard areas.</p>	<p>In some instances, the local governments are required to follow regulations imposed by the federal government. Local and state governments often perceive federal requirements as being overly prescriptive and coercive. State and local officials have complained about the failure of federal agencies to fund the cost of planning/project implementation; the lack of flexibility in the required actions; and the shifting of blame for infringement of property rights to local agencies. As a consequence, local and regional government agencies can be reluctant partners in intergovernmental arrangements. Therefore, lacking commitment can thwart efforts to accomplish long-term goals, including those of coastal restoration projects (Dalton and Burby 1994).</p>
<p>Land use planning in mandated states, mostly use private consulting firms who use professional planners and experts which enhance land use plan quality;</p>	
<p>Due to the state planning mandates, local governments are required to prepare land use plan, which means that significantly more communities will plan for future development than would have without the mandate.</p>	

Some of the other challenges from intergovernmental conflicts are listed below:

- It is to be noted that although land use planning is in the hands of local government, it is mostly dependent on how much authority is invested in their hands by the state government. Taking away part of this authority is generally met with resistance from local governments (Burby and May 1997).
- In terms of the acquisition of land, there is a constant conflict between government interest and landowners' property right in building restoration projects. Appropriate relocation cost and adequate flood control are major conflict areas when it comes to acquisition procedure.

- According to Bunnell and Jepson's (2011) research on the quality of state-mandated land use plans, the practicing planners often lack proper understanding of the objective of policies, strategies and actions. It was mainly due to inexperience and a lack of comprehensive planning within these local communities. The authors note, "much more needs to be done to strengthen local understanding of the basic planning concepts, especially if state governments are going to require municipalities to require plans" (2011:35). Very few states have local plans that include alternative scenarios based on evolving future trends with regards to coastal land loss (i.e. adaptive management).

### ***3. Dredging and Diversion***

Conflicting interests and competing missions have been noted between and within the regulatory agencies and the stakeholder groups in terms of dredging and beneficial use of material dredged to maintain navigational channels. One of the examples of such competing mission is the Army Corps of Engineers' dual and often conflicting responsibility of dredging and dumping sediment into deep water to support navigation, while at the same time participating in freshwater sediment diversion projects for wetland restoration.

Beneficial use of dredged material is defined as using dredge material as a resource instead of waste. It is a practice of taking the material dredged from the channel (usually done during channel maintenance) for applications such as beach nourishment and wetland restoration. While not always followed by federal agencies, Louisiana has the most comprehensive and efficient beneficial use of dredge material policy designed to encourage sediment deposition to restore wetlands.

#### *Historical Perspective*

Most of the dredging projects in the country are associated to navigational projects carried out by the USACE and funded by port authorities. Prior to the regulation of dredge and fill activities in wetlands, large areas of swamp and marsh were converted into developable land for agricultural, residential and industrial uses. With the advent of 'No-Net-Loss' in the 1980's, many of these practices were halted. However, dredge and fill for petroleum exploration,

pipelines, canal developments, and industrial uses have continued and have directly and indirectly contributed to marsh destruction<sup>3</sup> in the State. The Louisiana State and Local Coastal Resource Management Act of 1978 was passed to regulate dredging and dredge materials. Under this Act and the corresponding CZMA regulations, a Coastal Use Permit (CUP) is required for dredge and fill projects located in the coastal zone. Therefore, it is very important to understand the current coordination mechanism and permit processing policy to identify dredging policy that causes conflict during permit approval process.

### *Present Condition*

While the authority for regulation of dredging and dredge material management in Louisiana lies with the State through the Local Coastal Resource Management Act and the CZMA, the USACE performs dredging projects to deepen and maintain navigational systems without the need to coordinate with the State. The USACE is also responsible for permitting non-federal (i.e. local) dredging activities in wetlands under §404 of the CWA, §103 of the Marine Protection, Research, and Sanctuaries Act (MRSA), and §10 of the River and Harbors Act (RHA)<sup>4</sup>. Extensive coordination networks are needed for permitted projects and projects that undergo federal consistency review. This coordination relies on mechanisms such as memoranda of agreement (MoAs), regulations, and policies between federal, state and local agencies. Agencies that participate in this are the Louisiana DNR, the DEQ, State Lands Office, Department of Health & Hospitals, USACE, US Fish and Wildlife Service, NMFS and the US EPA. DNR, USACE, and DEQ have a joint agreement for the monitoring and processing of CUPs as part of a comprehensive coordination system. Federal consistency determinations are monitored weekly in the official state journal for comment from federal and state regulatory agencies, parish governments, and the general public. While these coordinated efforts are well established for development projects, rarely is there the same coordination between agencies

---

<sup>3</sup> Coast 2050 towards a Sustainable Coastal Louisiana, pg41; Louisiana Department of Natural Resources

<sup>4</sup> National Coastal program Dredging Policies; April 2000, , Jennifer L. Lukens OCRM/CPD Coastal Management Program Policy Series

with regards to beneficial use of dredge material. Thus, the opportunity to restore wetlands is not as great as the opportunities to destroy them through development.

**Table 4.3 Intergovernmental Coordination and Conflicts in the Preferred Method of Restoration**

<b>Benefits of intergovernmental coordination in method of restoration</b>	<b>Challenges from Intergovernmental Conflicts in method of restoration</b>
<p>Annually in Louisiana, approximately 60-90 million cubic yards of material are removed from federally maintained navigation channels. To date, approximately 7,500 acres of vegetated wetlands have been created across the state through placement of dredged material resources</p>	<p>Twenty-seven out of thirty-two CMPs have policies regarding beneficial use of dredge material, but most of them lack in content, specialty and enforceability. Although most of the policies encourage beneficial use, they fail to outline the means by which beneficial use projects should be developed, reviewed and implemented;</p> <p>The environmental gains resulting from beneficial use of dredge material are not calculated into a cost benefit for a dredging or maintenance project. State and local government issues regarding the need for environmentally sound practices of beneficial use of dredge material need to be a part of the plans;</p> <p>Oftentimes dredging projects cause reduction in the natural supply of sediments and nutrients by alteration of freshwater flow. This results into detrimental effect on the fragile marshes;</p> <p>There are instances when additional cost to use dredged material beneficially is too high and beyond the budget of the USACE. In this case, Water Resource Management Act authorizes the Corps to share up to 25% the cost of implementing the project with a local sponsor. USACE has revoked approximately as much as a quarter of its funds to the New Orleans District thereby leading to the suspension of beneficial use projects while simultaneously planning with the state for other coastal restoration projects. In this case federal policies are clearly at odds.</p>



#### ***4. Funding and Implementation of Plans***

Governmental coordination and funding is critical for coastal restoration projects. Protracted and cumbersome funding processes and incompatibility between state and federal policies can cause restoration programs to falter in delivering desired results within a specific timeframe (Lowry 2007). For instance, the CIAP was established to mitigate coastal impacts related to offshore oil and gas activities. The policy intended that oil and gas producing states would be eligible to receive a portion of the oil and gas federal revenue from the leasing of the outer continental shelf sites to the oil companies. However, the funds will not be awarded until year 2017, which is 15 years after the program, was initiated. This makes it nearly impossible for states to plan for and fund desperately needed restoration projects today. Further, it is hard to know what baseline conditions will be in 2017, so detailed planning is also difficult.

On the implementation front, scholars have recommended that statutory, administrative and socio-environmental conditions should be in favor for effective implementation of plans and policies. Any form of incongruence in the above-mentioned sector can cause implementation gaps. The implementation gap is defined by Lowry (2007: 288) as an “inconsistency between a policy idea conceived at one level or branch of government and the translation of that idea into specific actions at another level or by another branch.”

#### *Present Condition*

Maintaining consistent funding revenue has always been vital to long term success of any restoration program. Large-scale restoration programs usually get delayed due to a lack of the consistent sources of funding (Plaquemines Parish 2013). Since many of the coastal restoration projects are interrelated, delay in one project leads to undermining the performance of the entire restoration program. All coastal Louisiana parishes compete for limited grant money for restoration projects thereby creating a backlog of projects across the state requiring funding and coordination. It has been observed that a parish may secure funds for one piecemeal project but has no guarantee of securing federal funds for its entire coastal protection program.

**Table 4.4 Intergovernmental coordination and conflicts in Funding and Implementation strategy**

<b>Benefits from intergovernmental coordination in funding and implementation strategy</b>	<b>Challenges from intergovernmental conflicts in funding and implementation strategy</b>
<p>Several Federal agencies have sponsored restoration projects. Some of the major funding agencies are i) EPA, ii) NMFS, iii) NRCS, iv) USACE, v) United States Fish and Wildlife Service (USFWS) and United States Geological Survey (USGS).</p>	<p>Lack of coordination between federal, state and local government agencies causes inadequate collaboration with regional coastal restoration programs and strain the limited amount of grant money;</p>
<p>Some of the other sources of funding that are going to be available to the state and Parish in the future are from BP Oil fine money and CIAP.</p>	<p>Lack of aggressiveness or initiative by local governments to seek opportunities to partner with other parishes and regional organizations for cost-sharing of restoration projects;</p>
	<p>Despite streamlined permitting of regulated activities in each jurisdictional wetland, securing the necessary authorization is time-consuming. The increased permitting time leads to delay which impacts the outcome of overall restoration program;</p>
	<p>Impediments are experienced during implementation of the restoration project in the form understanding landownership (government or private), surface-mineral rights, damages and access to public resources.</p>

### *Gaps in the Literature*

The consensus in the literature is that progress towards sustainable coastal development depends on the coordinated efforts of each jurisdictional level. Federal and state agencies should work in tandem and follow the process of a bottom-up approach by including localized planning in policy design (Galloway 2006). Applying such an approach will also help to alleviate the situation in intergovernmental coordination that leads to inconsistency between policy directives conceived at one level of government that need to be implemented by another level. Lowry refers to this as an implementation gap, meaning that there is an inconsistency in translation of a particular policy idea into specific action at another level or by another branch of the government (Lowry 2007). While this is recognized, there are few studies that examine this aspect of intergovernmental coordination in practice.

Completely missing from the literature are studies addressing the intergovernmental coordination in various plan elements at the local level in Louisiana. In particular, I will be studying the coordination between local planning, coastal zone planning, and coastal restoration planning, which to date has not been studied anywhere. No analysis or study has assessed the effectiveness of the existing intergovernmental coordinating mechanism, or identify specific problems and needs within each element of the coastal planning process.

Much of the management literature on Louisiana's experience with land loss is scientifically based or specifically addresses the individual plans themselves. However, missing from the literature is a discussion of the role of collaborative governance in the process of adaptive management. This study will add to the literature by providing additional qualitative work that focuses on intergovernmental coordination and effective adaptive management in the Louisiana coastal zone planning process.

### *Restating the Research Question*

Throughout this study, the analysis will consider three main research questions:

- What policy initiatives were taken at various levels of government to address the issues of land loss in Plaquemines Parish?
- Are there intergovernmental conflicts in the four identified coastal restoration plan focuses chosen for this study (i.e. coastal water resource management, dredging and diversions, coastal land use planning and funding and implementation)?
- How can adaptive management and intergovernmental coordination make Plaquemines' Parish coastal restoration process more efficient?

## Chapter V

### Methodology

#### *Introduction*

In response to Louisiana's coastal land loss problem, the state and local governments face an urgency to reverse the continuing trends of land loss. Thus, it is essential to have effective policies in place to address the issues outlined in the previous chapter. Effective policy response requires intergovernmental coordination and integration, and it depends on a collaborative and sometimes coercive model of policymaking to achieve success. In order to explore these issues in detail, I obtained evidence by examining the various conflict areas of coastal restoration plans and policies in Plaquemines Parish. In order to focus the investigation, I concentrated on water resource management, dredging & diversions, land use, and funding & implementation of plans. In particular, I tried to identify the areas of intergovernmental conflict that influence the overall effectiveness of coastal planning and restoration at all levels of government. In this chapter, I present my rationale for selecting a case study approach; describe how I selected the case and how the data analysis is performed.

#### *A Case Study Research Design*

I selected a case study research for three main reasons. First, according to Yin (2003: 11), a case study design is appropriate when the focus of the study is to answer "how" and "why" questions. Such questions are more explanatory in nature, and demand case study research. In this thesis as well, the overarching question focuses on how and why do government bodies coordinate and integrate to implement coastal restoration policies and programs. Second, Yin (2003) defines a case study an empirical inquiry that investigates a contemporary phenomenon in-depth and within its real-life context, most-appropriate when the boundaries between phenomenon and context are not clearly evident. In my research, Plaquemines Parish is investigated as the real-life context for coastal/large-scale ecosystem planning and restoration. The literature review demonstrates the phenomena of intergovernmental conflicts and coordination throughout the planning process of environmental and coastal management plans.

Some of the examples of conflicts in policy/plan making are: i) disagreement among the different levels of government on the preferred method of restoration. ii) Dredging and diversion and beneficial use and allocation of dredged material, iii) Acquisition and property right, etc. Some of the areas where intergovernmental coordination has resulted in successful coastal restoration are i) State planning mandate where local government develops the land use plan, ii) adopting adaptive management techniques to resolve watershed management issues, iii) Federal and state agencies collaboratively funding local restoration projects, etc. Third, Gillham (2000) notes that no one kind or source of evidence is likely to be sufficient on its own. There should be use of multiple sources of evidence; each with its strength and weaknesses is the key characteristic of a case study research. Yin (2003) also agrees to the above observation made by Gillman and indicates that case studies are appropriate when there are more variables of interest than data points, and, as a result, the inquiry relies on multiple sources of evidence and data triangulation. My research relates to this model and draws evidence from multiple sources such as stakeholder's interviews, direct observation as well as several other secondary data sources including federal, state & local coastal restoration policy documents, U.S Census data and projections and archival data (e.g. newspaper articles, maps & public meeting memorandum). In the literature review of the intergovernmental conflict, researchers (Nance and Ortolano 2007, Jessen 2007) agree that a detailed case study is necessary to portray a clear picture of the governmental working and implementation of the plans.

#### *Case Study Selection Criteria*

By definition, a case can be an individual, group, institution or a large-scale community (Gillham 2000). My fundamental objective in choosing a case (in my research, a large-scale community) was to select an example Parish that illustrated the diversity of restoration policies and conflict in the decision-making process that were known to exist. Examining both failure and success of the coastal restoration policies provides an opportunity to learn from the contrast (Nance 2011). Secondly, Stake (2005) considers the 'case' the defining criteria for a case study. He further points that the preferred case must be a well-bounded, specific, complex and functioning "thing" (e.g., a person or program) and not a generality. Therefore, the case in my

research is Plaquemines Parish, the southernmost parish in the state of Louisiana. I used five criteria to select a case study site, which are outlined in Table 5.1 below.

**Table 5.1: Five-Point Case Selection Criteria**

---

<b>Case Selection Criteria</b>
1. Unique geographical location of Plaquemines Parish (Active Delta, High subsidence, affected by sea level rise);
2. High depopulation in the region post-Hurricane Katrina;
3. High number of Repetitive Flood Loss properties and total loss from the claims made post-Hurricane Katrina;
4. Variety of data sources available to conduct an analysis of policies. Also, access to project staff and beneficiaries of the coastal restoration policies;
5. Parish should have at least five years of experience in coastal restoration planning so that implementation gap (if any) between federal, state and local planning efforts were studied.

---

### *Data Analysis*

In order to understand the data analysis methodology, it must first be clarified that the topic is qualitative and explanatory in nature. The results from all the existing plans are yet to be realized, but the intergovernmental coordination can be studied utilizing the established literature on intergovernmental coordination, and the policy directives contained within the respective plans.

### *Generalizing from a Case Study to Theory*

The intent of the case study research is to test the hypothesis that existing theories from the urban planning literature should be applied to the coastal restoration plans to ensure the plans are effective in restoring and regenerating coastal land. Therefore, I have used analytic generalization as a mode of generalization. In this process, the previously developed theory is used as a template with which the empirical findings from the present case study are compared. According to Yin (2003:39), this type of generalization can be used in studies that involve one or

more than one case studies. Plan assessment and plan element analysis is the key concept of the thesis methodology.

In the preliminary phase of the study, a thorough review of the existing coastal plans was conducted. While comparing the goals and objectives of each plan element at the state and local level government, many instances of discrepancies or incompatibility were observed among each level of the government in the decision-making process. Literature review was conducted related to the discovered data of social research that in this case is intergovernmental conflicts in coastal plan elements related to land and water resources. In order to have a focused investigation, this thesis studied the water resource management, dredged material management, funding for implementation and land use policies to identify the intergovernmental conflict that influences the overall quality of coastal plans at all level of government. The theory related to intergovernmental conflict was then studied using *Readings in Planning Theory* (Campbell and Feinstein 2003) and Patsy Healey's (1996: 217-34) communicative planning approach was identified as a theory concerning intergovernmental conflicts. Resolving such governmental issues was found to affect the new practice of adaptive management in the coastal zone. According to Healey (1996: 249) "Planning, and specifically environmental planning, is a process for collectively, and interactively, addressing and working out how to act with respect to shared concerns about how far to go and how to "manage" environmental change." This, therefore, justified the use of urban planning literature to resolves environmental and coastal issues at hand. First question is answered by identifying government documents comprising of federal, state and local coastal plans (post-Hurricane Katrina) that are available to the public.

The second and third research question of this study attempts to break down and test the hypothesis that practice of collaborative governance in adaptive management will ensure effective coastal restoration in Louisiana. To answer the second question: Are there intergovernmental conflicts in the four identified coastal restoration plan focuses chosen for this study (i.e. coastal water resource management, dredging and diversions, coastal land use planning and funding and implementation)? I identify intergovernmental coordination and



conflict in the four broad focus areas (i.e. coastal water resource management, dredging and diversions, coastal land use planning and funding and implementation), and attempt to determine the impacts of intergovernmental conflicts and coordination on the coastal planning and restoration efforts in Plaquemines Parish. I selected a qualitative policy assessment strategy modeled after Bardach's (2011) *Eightfold Path*, which emphasizes on the fact that policy analysis draws on intuition as much as on the method, but that there needs to be a clear process when these types of analyses are undertaken. Therefore, Bardach (2011) developed his approach to problem solving as follows: i) define the problem, ii) assemble evidence, iii) construct the alternatives, iv) select the criteria, v) project the outcomes, vi) confront the trade-offs; vii) decide, viii) tell your story (findings). Bardach also notes that these steps do not necessarily need to be taken precisely in this order, and not all the steps are significant in every problem. For my analysis, I have re-arranged and streamlined the steps according to the needs of my research. Below are the steps for assessment of the plan focuses:

1. Definition of the problem;
2. Select criteria for choosing particular plan focus area;
3. Assembling the evidence through data sources about intergovernmental conflicts;
4. Project the outcomes;
5. Findings.

Below is a detailed discussion of the steps followed for the qualitative data and plan analysis:

*Step1. Definition of the problem*

Demand for coastal resources is growing faster than the ability to supply it at an acceptable environmental cost. Due to natural and anthropogenic pressure, coastal land in Louisiana is lost at the rate of 25-35 square miles per year. The problem presented in this research is about the policy response in coastal Louisiana at various levels of government. Due to the presence of multiple agencies managing coastal resources, there

is a constant tension among each level of government throughout the planning process. Such tension largely affects efficient plan making.

*Step2. Select Criteria for Choosing the Plan Elements*

In order to investigate intergovernmental relationships, this research sets criteria for choosing the particular focus areas (i.e. coastal water resource management, dredging and diversions, coastal land use planning and funding and implementation). The criteria are as follows:

- i) The focus areas involve federal, state and local government agencies, each with decision-making capacity;
- ii) The focus areas are related to land and water resources. As both land-oriented development (real estate, canals, ports, and refineries) and water oriented activities (on and offshore facilities, fisheries, and navigational waterways) continue, the existing land and water resources required to accommodate this development is continually stressed (Hershman 1975). As the land disappears, and development continues, the literature indicates that there will be conflict among competing users. Just like land owners, agencies who manage these resources also have conflicting views that affect the decision-making process;
- iii) The federal funding for implementation of plans should affect all the chosen focus areas. Since the available funding is limited compared to the number of existing plans in this region, it is imperative to study the intergovernmental functioning.

### *Step3. Assembling the evidence through data sources*

Multiple sources of evidence were used, many of which are commonly used by researchers in case study research. I have used secondary data, documentation, interviews and direct observation as my sources.

#### *3.a. Secondary Data*

Secondary data were available through internet searches. They include information that consists of the following variety of documents:

- Letter, memorandum and email-correspondence;
- Meeting agendas, meeting minutes and other written reports;
- News clippings and other articles appearing in the mass media or community newspaper.
- “Public use files” such as the US Census and other statistical data made available by federal, state or local government.
- Maps and charts of geographical characteristic of Plaquemines Parish.

Because of the abundance of secondary data sources, it was very important to focus on pertinent case study information. Systematic searches for relevant documents were very important to corroborate and augment evidence from the other source of information.

#### *3.b. Interviews*

Interviews are an essential source of case study evidence because they are mostly about behavioral events or about human affairs (Yin 2003). Eight interviews were conducted in total. The semi-structured (or guided conversation) interviews were a flexible and productive research tool to address my questions (Gillham 2000, Merton, Fiske, and Kendall 1990). As recommended by Rubin (2012), the stream of questions I put forth were fluid rather than rigid. The major purpose of a semi-

structured interview is to corroborate the obtained data with information from the other sources. Secondly, such interviews give researchers a scope to deliberately interview candidates who hold different perspectives. It allowed me to understand the issue from a different viewpoint. Some of the criteria for choosing the participants were:

- Their knowledge about the topic and setting;
- Respondents who were in authority and ready to share their experience, and their structuring of the knowledge gained;
- Respondents who are particularly informative about where documents and records are to be found.

Participants of this interview included residents living in the case study area. I also chose to interview people in a position of authority that I believed were able to provide answers with insight and a comprehensive grasp on the topic. Additionally project managers, social scientists, engineers who worked during the coastal plan making process were also interviewed. Based on the above criteria, I structured two separate groups. i) resident/beneficiaries; ii) plan designer or professional practitioner in the field of coastal restoration.

- i) *Beneficiaries*: Refers to randomly selected residents who were affected by coastal land loss and restoration policies in Plaquemines Parish. It included residents who lived in the Parish pre- and post-Hurricane Katrina.
- ii) *Practitioners*: refers to coastal scientists, planners and consultants for the Plaquemines Parish Comprehensive Master Plan development and administration. They were not selected at random. The participants were included in the study because of their critical role in researching current

conditions along with their experience, knowledge and involvement in the case study area.

### *3.c. Instruments and Procedure for the Interviews:*

Two different semi-structured interview protocols were developed for the interview groups of beneficiaries, coastal planners and practitioners. These interview protocols were designed to guide me during the interview process to understand the respondent's views and policy knowledge. The interview guides contained open-ended, rating and subjective questions.

I developed the interview guides and had them reviewed by The University of New Orleans Human Subjects Committee before using them for the interviews. The interview protocol consisted of the interview guide, consent form and an invitation to participate in the study. An approval letter from Institution of Review Board (IRB) was received via email (See Appendix B). Thereof the process of interviewing started. The first step was to send a formal electronic mail to set up an appointment with the respondents before the face-to-face interview was performed. In some cases, due to time limitations and unavailability of certain respondents, interview guides were sent online to collect information. The privacy of all the respondents is maintained throughout the study. None of the quotations used in this document were attributed to any individual respondent who took part in this process.

### *3.d. Direct Observation*

In a case study research, multiple methods of data collection are employed. Yin (2003) notes direct observation as a source of evidence that contributes to the development of a strong case study. Additionally, it provides an opportunity for researchers to observe directly what is currently happening in the research setting.

Since the processes being examined in this case study, are on going there were opportunities for direct observation. Such direct observation serves two purposes i) it is another source of evidence in a case study, ii) this evidence can be useful in providing additional information about the topic being studied. Less formal direct observation can be done through field visits in the case study area. Additionally, photographs of the site may also convey important case characteristics about coastal land loss to outside observers.

### *3.e. Documentation*

Study of archival and government records are an integral part of the case study research methodology. Examples of such kind of documentation include:

- Administrative documents that include the coastal restoration plans for the state of Louisiana and Plaquemines Parish. Plan studied are as follows:
  - Coast 2050;
  - The Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA);
  - Louisiana Coastal Area (LCA);
  - Comprehensive Master Plan for sustainable coast, 2012;
  - Plaquemines Parish Comprehensive Master Plan (2013)[Plan Section E: Coastal Protection and Restoration and Plan Section D: Existing Land Use];
  - CZMP Update (2013);
  - Plaquemines Parish Strategic Implementation Plan (2008).
- Formal studies or evaluation of the plan document performed by the state coastal restoration agencies.

#### *Step 4. Project the Outcomes*

This step mainly focuses on the outcome of the analysis performed using the assembled evidences. This section compares goal and objectives of each restoration plan to investigate the intergovernmental functioning.

#### *Step 5. Findings*

Findings concentrate on any intergovernmental conflict and coordination that is found through the research, and guide any recommendations made to make the coastal planning and restoration process more efficient and effective. The recommendations made are specific to Plaquemines Parish and coastal Louisiana - drawing on particular weaknesses or conflicts of intergovernmental relationship noted in the process. However, based upon the literature review of intergovernmental coordination in environmental management and plan assessment, many of the findings and recommendations are applicable to other cases.

This exercise followed communicative planning approach to reviewing the coastal plan focus areas that led to the identification of benefits and challenges caused due to intergovernmental conflicts and coordination. Inference was again conducted to determine conflict and coordination in the specific plan focus areas. The review formed the basis to answer the third research question: How can adaptive management and intergovernmental coordination make Plaquemines Parish coastal restoration process more efficient? Through the evaluation of the coastal plan focus areas with the use of communicative planning theory, Bardach's eightfold path to policy analysis and inference, an improved process for the implementation of adaptive management is recommended as sustainable solution to efficient coastal restoration planning.

## Chapter VI

### Assessing Intergovernmental Coordination in Plan Focus Area

Success in efforts to save the coastal communities depends on implementing strong and coordinated policies. Based on the review of the existing literature, there is evidence of different forms of collaboration and conflict among various levels of government regarding coastal restoration. It has been observed that environmental governance is easier in a large-scale process than in small-scale decentralized governance. Coastal restoration in Louisiana extends across different levels of social and institutional aggregation which results in difficulty in realizing a common goal or objective. This chapter, therefore, focuses on the findings from the assessment of intergovernmental functioning in four plan elements and investigates the issues that arise from the federal consistency provision of CZMA.

Furthermore, this chapter also attempts to tie together the concept of collaborative governance with the practice of adaptive management. In adaptive management, policies become hypotheses and management actions experiments to test these hypotheses (Folke et. al 2005). The practice requires continuous monitoring, evaluation and calibration of policies. Collaborative governance, also known as “adaptive governance” is, therefore, a pre-requisite for good adaptive management. The term adaptive governance is defined as social and institutional arrangement that provides an organizing frame work for adaptive management.

Since the study is based on analytic generalization, it will finally state if the finding in this chapter is consistent with the studies that has been performed earlier in the literature review section. In the process, the following discussion will provide an in-depth analysis of intergovernmental functioning in the areas of coastal water resources management, land use for coastal restoration, dredging and diversion as the preferred method for coastal restoration, and funding and implementation of coastal restoration plans in Plaquemines Parish. Bardhach’s (2011) “*A Practical Guide for Policy Analysis. The Eightfold Path to More Effective Problem Solving*” provides the analytical framework to assess the plan elements.



## ***1. Coastal Water Resource Management***

### *Problem Definition*

According to Galloway (2006), there has been no coordination in federal efforts regarding the water issues since the abolition of Water Resources Council (WRC) in 1983. Water Resource Council was directed by Water Resource Planning Act of 1965 to develop Principle and Standards (P&S) for planning water and related land resources. Due to change of Presidency and change in the respective Presidents' water policy, WRC was disbanded.

Except for enforcing stringent water quality standards, a vacuum was observed related to other water issues at the national scale. Therefore, this study investigates critical permitting programs such as 401 and 404 certifications of CWA for water quality and watershed planning as a part of water resource management. These two sub-elements are also among the most important factors for the case study site.

### *Criteria for Choosing Plan Focus Area: Water Resource Management*

- Involves federal, state and local level governments in the decision-making process.
- This element has a large impact not only on the Parish but also on the entire Gulf Coast.

### *Assembling Evidence*

- Plaquemines Parish Comprehensive Master Plan (2013);
- Louisiana's Comprehensive Master Plan for a sustainable coast (2012);
- Plaquemines Parish Strategic Implementation Plan (2013);
- Newspaper Articles;
- Clean Water Act;
- Louisiana coastal restoration webinars;
- Stakeholder Interviews.

### *Policy Outcomes*

U.S EPA in association with the state governments has established wetland water quality protection laws and regulations such as a 401 and 404 certification program under the CWA. The water quality affects the overall watershed management of the Mississippi River. Below is a summary of both the certification program and how it related to Plaquemines Parish coastal restoration planning and water quality.

#### *Water Quality:*

- *401 Certification Program*

Section 401 of the CWA mandates that the state or tribal agencies approve, deny, or control the activities that would result in discharge of water from the project site into the state or local waters, including wetlands. Decisions to approve, deny or restrict a federal permit are done on a case-by-case basis. U.S.EPA reviews these projects based on an individual project's potential to violate CWA water quality standards and possible alternatives and mitigation measures. In 1998, the U.S. EPA under the "No-Net-Loss" wetlands policy started encouraging states to aggressively make use of their Section 401 authority in order to protect wetlands from chemical discharges or other types of alterations in the wetlands. U.S. EPA also served guidance documents to the states for establishing their individual water quality standards specifically for coastal marshes. These standards were intended for use in approving or denying a 401 certificate. According to the Environmental Law Institute<sup>5</sup> (ELI) (2008), Louisiana is among 33 states that exclusively depend on 401certification as their primary means to protect their wetlands. So far, only 13 states have developed wetland-specific water quality standards that they mostly use in conjunction with 401certification.

---

<sup>5</sup> Environmental Law Institute (ELI) is an internationally recognized, non-partisan research and education center working to strengthen environmental protection by improving law and governance worldwide.

- *404 Certification Program:*

Section 404 of the CWA mandates that the state or local agencies can approve, deny or control dredge and fill activities. These activities are defined as the one that would result in discharge of dredge/fill material into the water bodies including wetlands. Some of the regulated activities under this section are:

- i) Fill from water resource projects;
- ii) Infrastructure projects;
- iii) Mining projects;

Exempt activities such as certain farming and forestry related projects are waived of the Section 404 requirement. The underlying principle of this certification is to prevent the disposal of dredge/fill material under the following circumstances:

- a) If a practicable disposal alternative exists that is proven to be less detrimental to the aquatic environment;
- b) If water bodies (including wetlands) would be significantly degraded.

Permits are granted for dredging or filling in wetlands only after states and local governments deliberate and approve projects that demonstrate that i) sufficient steps have been taken by project planners to prevent adverse impacts to the wetlands, ii) use of best management practices/technologies have been employed, and iii) provide adequate compensation for any residual/unavoidable impact. The existing regulations responsible for coastal wetland protection are preventive in nature. In other words, Section 401 and 404 are written to ensure that existing wetlands are not subjected to further degradation due to future projects that can impact coastal wetlands. However, these laws are incapable of enforcing wetland regeneration that leads to i) net gains in wetland's area, ii) regeneration of existing wetland area that are severed from their historic floodplains (ELI 2008).

It is observed that despite having 401 and 404 certification programs in place, Plaquemines Parish filed a set of nearly 30 lawsuits alleging the energy companies and contractors of destroying and polluting the Parish's coastal areas (Adelson 2013). The lawsuit makes two major claims against the oil companies. First, by turning marshes into open water (with oil and gas drilling projects), the companies indirectly put more stress on flood protection levees. It consequently violates the federal Rivers and Harbors Act, which prohibits any activity that "impairs the effectiveness of a levee" (Marshall 2013). Second, by turning marsh to open water, the projects also increase the risk from a storm surge that moves into the metro area during tropical storms and hurricanes. The suit claims that there is a violation of a principle civil law called "servitude of drainage," which prohibits one person from increasing the flow of water onto someone else's property (Marshall 2013). Apart from the issue of permitting it is also important to maintain water quality of the marshes and wetlands. Therefore, it is essential to impose stringent penalties for Section 401/404 violations of the CWA. Current penalties are extremely low compared to that in other states for a similar offense.

*Watershed Management:*

Protection of wetlands depends largely on the quality of the surrounding environment. U.S. EPA, therefore, promotes an integrated environmental protection program for wetlands by addressing the entire watershed. Water resource management and pollution control of air, land and water bodies surrounding the wetland is included in the integrated watershed planning approach. EPA's wetland division incorporates the following:

- Guidance connecting wetlands protection with watershed planning;
- Funding and grant opportunities to develop state watershed protection projects;
- A watershed approach in Federal floodplain management activities.

Some of the ongoing conflicts related to watershed management in Plaquemines Parish are as follows:

The literature review in chapter IV indicate that altered hydrology (through diversion, floodwalls and navigational canals) of the Mississippi River have caused algae bloom and dead

zones in the mouth of the Mississippi River. It is believed that the existing swamps are weak in nature due to reasons like rapid growths of invasive plant species such as pea vines and lilies (that are breeding due to high nitrate content in the river water). Such plant species are creating the illusion of healthy land, but in actuality these plants lack proper root system to constitute healthy marsh vegetation. In the event of a storm surge, these types of plants are wiped away leaving the area with floating mud and water. The results from the interviews performed further validated my findings.

### *Findings*

The Table 6.1 summarizes the findings from the assessment of the plan focus area of water resource management. Some of the key findings are:









- *Water Quality:* Although, there are established U.S.EPA wetland water quality standards through 401 and 404 programs of CWA, review of the coastal plans signify that state of Louisiana fails to coordinate and institute any state specific water quality standard. Additionally, findings indicate that Louisiana has over 340 streams on EPA's 303 (d) impaired stream list due to non-compliance by Louisiana Environment Quality (LDEQ) of the EPA's water quality standards. Pollution from point and non-point source is the main reason for impairment of these water bodies. It should be noted that non-compliance and violation of the federal requirement is a form of intergovernmental conflict between federal and state, state and local government. However at the local Parish level, proactive measures are seen to be adopted. Parish divided its area into smaller geographical areas or Environmental Management Units (EMUs) to have environmental resource management in the area. The Parish also took the initiative to introduce freshwater as an attempt to impede growth of pea vines and lilies. Such invasive plant species, as discussed earlier, causes soil erosion and land turning in open water. Proactive Parish planning effort, therefore, coordinates with overall federal policy of clean water.

- *Watershed Management:* According to the US EPA's *Handbook for Developing Watershed Plans* (2008), the federal government acknowledges land use as a major factor in the practice of watershed management. But at the state level, Coastal Master Plan fails to consider land use plans of local parishes comprehensively while designing the coastal restoration projects in the Mississippi watershed. This may be because water quality of the watershed and land use planning are both administered by different agencies that fail to coordinate. While there is a conflict between federal and state government, local Parish conforms to the federal watershed management practices. For example, the Parish CZMP uses Best Management Practices (BMPs) through the EMUs that has a goal to encourage land use that is compatible with wetlands and aquatic environment.

#### *Implication of the Findings on Adaptive Management*

Findings from the review of water resource management indicate that there is lack of coordination between state and local government. Adaptive management solely intends to reform coordination among responsible authorities by focusing on learning as a key way of combating uncertainty and promoting adaptivity. The theory of adaptive management is also concerned with changing the way in which responsible authorities view and undertake management action. Therefore, identifying and resolving above discussed intergovernmental conflicts will be a step towards effective adaptive management in water resources sector.

**Table 6.1 Water Resource Management Summary**

<b>Items</b>	<b>Federal (CWPPRA, CZMA)</b>	<b>State (Coastal Master Plan 2012)</b>	<b>Local (PSSIP, Parish Master Plan, CZMP)</b>	<b>Conflicts</b>  <b>Coordination</b> 
<b>Water Quality (CWA)</b>	Established Water quality standards through the 401 and 404 programs.	Non-compliance by LDEQ of the EPA Water Quality standards has caused Louisiana to have over 340 streams on the EPA 303(d) list of impaired streams (EPA).  State of Louisiana has no wetland-specific water quality standards (WQS).	The Parish created (EMU) to maintain water quality compatible with designated uses.	 Federal-State  State- Local  Federal- Local
<b>Watershed Management</b>	Land use as a major factor in watershed management (US EPA).	CPRA Coastal Master Plan does not consider land use plans of the local parishes comprehensively while designing the coastal restoration projects in the Mississippi watershed.	CZMP uses EPA's BMPs through EMUs to encourage land use that is compatible with wetlands and aquatic environments.	 Federal-State  State- Local  Federal- Local

## ***2. Coastal Land Use and Regulations***

### *Definition of the Problem*

With increasing land loss and several restoration projects (small-scale/large-scale), the coastal areas of southeast Louisiana are the target of accelerated land use change and the conflicts associated with such changes. Activities compete for the same resources on which the coastal communities traditionally depend on.

### *Criteria for Choosing Plan Element: Land Use and Regulations*

- Involves federal, state and local level government in the decision-making process.
- This element has a large impact not only on the Parish but also on the entire Gulf Coast.

### *Assembling Evidence*

- Plaquemines Parish Comprehensive Master Plan;
- State Coastal Master Plan 2012;
- Newspaper articles;
- Clean Water Act;
- Stakeholder interviews;
- Land use maps.

### *Policy Outcomes*

Although Plaquemines Parish encourages land use compatible with wetlands (Evans-Graves Engineers 2013), some of the crucial issues with intergovernmental coordination related to land use in Plaquemines Parish are as follows:

#### *Zoning Laws:*

The Parish's Comprehensive Master Plan (2013) indicates that the zoning laws in the Parish are not very strong. Strong planning and corresponding zoning laws are important because they can direct development away from critical areas such as floodplains and wetlands. The high hazards areas should be matched with appropriate land uses so that the flood prone areas are



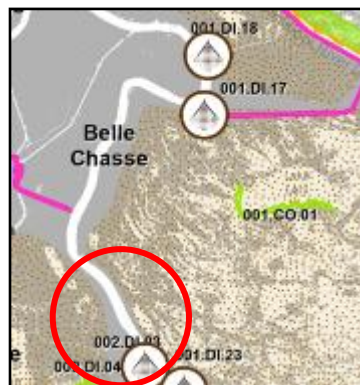
designated parks, greenways, wildlife refuge and so on. According to the literature review, land use in high hazards areas should also avoid development whenever possible. Although the Parish attempts to allow or require land uses that are compatible with the natural condition of the region, there is no government ratified document in existence currently. However, with political will they might be present in the future.

The Parish zoning department is underfunded and understaffed along with the potential for development permits being granted unlawfully due to bureaucracy. Review of the coastal plans and by researching the actual planning efforts in the Parish indicate that there is a pro-development slant in both the state and local level government. It has been established by a recent example of land use conflict in the Parish. The conflict revolves around the local and state government collaboratively granting a CUP for a coal terminal in the West Bank of Plaquemines Parish near the Myrtle Grove.

**Figure 6.1 Land Use Conflict in Plaquemines Parish**



*Source: The Advocate*



*Source: State Coastal Master Plan*

According to the LA DNR's office of coastal management, "the economic benefits of the project outweigh the anticipated direct impacts to coastal waters and resources, which are small if any." (as quoted in Wold, 2013). The permit was issued for the development of a coal terminal in roughly the same location that the Coastal Master Plan proposes for a sediment diversion for coastal restoration project. This action has been criticized by the non-profit organizations and

citizen groups on the grounds that the department has failed to protect Louisiana's coast and its people by granting a permit for highly polluting coal export terminal near Myrtle Grove and Ironton in Plaquemines Parish" (as quoted in Wold 2013). According to the permit agreement, both the facilities could co-exist most of the time. However, during the times when Mississippi is flowing at 600,000 cubic ft. per second or more, the state can implement a "peak operating period" where the facility will not have a permit to operate the coal terminal. Such events question the state and local priority of coastal restoration. Although it seems to be an area where state and local governments coordinate, it also draws into question local government's restoration priority and its commitment to zoning/regulation for restoration in opposition to economic development. Development prone planning in high-risk areas may be in conflict with overall federal plan for coastal restoration planning.

#### *Building Codes and Standards:*

Building codes generally require construction to the standards that are most suited to the natural setting where the structures are located, while at the same time providing the community with a certain degree of affordability. Prior to Hurricane Katrina, the State of Louisiana did not require communities to adopt a unified building code. As a result of the devastation of the Hurricanes of 2005, Louisiana adopted the 2009 International Building Code standards, and the state passed legislation that ensured rapid adoption of regularly updated codes. Although local communities are encouraged to use the statewide code, it is also imperative for the local communities to determine if the threat is higher than the building code's minimum standards. Therefore, it makes the building codes very stringent in Louisiana. The main challenge with coordination among state and local communities has been lax enforcement of these building codes because of a lack of funding. Without proper inspection, the state's strong building code may not be put into practice.

Apart from above reasons, there are issues and confusion over rapid change to the elevation requirement, building code and mitigation requirement that affect all the new construction, insurance, reconstruction and permits in the coastal parishes.

*Floodplain Management and NFIP:*

The federal government has recently revised the BFE to reflect recent flooding events more accurately. It means the approximately 5,000 buildings in Plaquemines Parish that are vulnerable to flooding are now significantly more expensive to insure. These buildings were built at or above the previous BFE requirements, but today no longer meet insurance requirements. With any major federal policy change (like the Biggert-Waters Act discussed in Appendix A) these properties/homes became too expensive to insure and very difficult to sell. Therefore, the overall goal for Plaquemines Parish to maintain affordability, will be to get FEMA to consider the Coastal Master Plan and on going levee improvements in the Parish as they consider BFEs (and by default insurance rates) – for which immense coordination is required.

*Acquisition:*

Property right issues associated with coastal restoration in Plaquemines Parish can, in many instances, act as a barrier to the restoration activities in the Parish. It causes conflict between private landowners and local, state and federal government agencies. As per Plaquemines Parish public officials, land acquisition is an important tool for coastal land use planning. The State can use the police power of expropriating lands for coastal restoration projects. Louisiana Revised Statute 49:214.5.6 states that the full police power of the state shall be exercised to address the rapid, ongoing, and catastrophic loss of coastal Louisiana, in order to devote the maximum resources of the state to meet this immediate and compelling public necessity. Land can be acquired by the state by providing just compensation to the impacted property owners. In certain cases, the Parish does not require full ownership of the land area but instead negotiates with landowners to seek servitudes over private property. For example, in order to discharge partially treated wastewater from wastewater treatment plants to nearby wetlands it is required to install effluent discharge force mains through servitudes acquired on private property to reach the discharge location. Even if the Parish needed full ownership, the

landowners would still be able to retain the oil, gas and mineral rights forever provided the drilling, and mining activities take place outside the project boundary area.

Based on the review of plans and the interviews performed (with landowners and officials at implementing agencies), there was an indication that although residents of the Parish agreed with the coastal restoration efforts, issues regarding right-of-way, servitudes and conservation easements were extensive. Most of the respondents believed that landowners understood the importance, benefits and goals of the restoration project, but agreement regarding compensation among multiple landowners for property acquisition or servitude often turned out to be an impediment to implementation of the project. Plaquemines Parish and adjoining parishes have had issues where restoration projects got stalled for years due to compensation conflicts.

### *Findings*

Table 6.2 summarizes the findings from the assessment of the plan focus area of land use and regulation. Some of the key findings are:

- Federal government sets building codes and standards in high hazard areas (like that of Plaquemines Parish). In coordination with the federal government, the state of Louisiana adopted 2009 International Building Code and passed legislation for adoption of the newer codes statewide. But at the local level, the primary challenge was to perform regular code inspection and enforce the same in the area. Furthermore, the Parish does not have any ratified document that contains the building code standards as yet.
- The permit for coal terminal in the place of proposed sediment diversion draws into question local government's restoration priority and its commitment to zoning/regulation for restoration in opposition to economic development. Developments prone planning in high-risk areas are in conflict with overall federal plan for coastal restoration planning.
- With any major federal policy change (like the Biggert-Waters Act discussed in Appendix A) the properties/homes in the high-risk area become too expensive to insure









and very difficult to sell. There has to be coordination between federal and local government in terms of flood insurance policies.

- Although the conflict with land acquisition is between government and private property owners, it is imperative for the state and local government to coordinate and strategies to resolve such situation without much delay in project implementation. Public outreach and education for the property owners regarding the coastal restoration projects will be a good point to start addressing the problem.

### *Implication of the Findings on Adaptive Management*

The conflict in land use decisions arise from the presence of governments, owners and consumptive users of land and water resources. Additionally, there are environmental activists, political control and outside investors. With the presence of so many players the group has conflicting goals regarding the land use. Adaptive management is completely unsuitable unless there is collaborative governance over all the resources. A collaborative approach requires stakeholders with divergent views to work together to produce knowledge that can be used in adaptive management of the coastal resources. The experimentation often takes a long time to gather significant findings and may thus be hard to reconcile with urgent decline in land area. Therefore it can be inferred that the implementation of adaptive management is extremely challenging by itself but having intergovernmental coordination can at least present grounds for some improvement.

**Table 6.2 Land Use & Regulation Summary**

<b>Items</b>	<b>Federal (CZMA, CWPPRA)</b>	<b>State (Coastal Master Plan 2012, CIAP)</b>	<b>Local (CZMP, PSSIP and Plaquemines Master Plan)</b>	<b>Status: Conflict  Coordination </b>
<b>Land use/ CUP</b>	-	To get the CUP, there is a requirement for state concern.	CUP also requires local concern. Figure 6.1 is an example of conflicts between state, local and other state agencies.	 State, Local- Federal
<b>Building Codes And Standards</b>	The federal government sets building codes and standards in high hazard areas like that of Plaquemines Parish	State of Louisiana adopted 2009 International Building Code and passed legislation for adoption of the newer codes statewide.	Local government agencies fail to enforce the strong building codes and involve code inspection.	 Federal- Local  State- Local  Federal- State
<b>Floodplain Insurance Policy</b>	Change in NFIP cause homeowners to pay high insurance premium	Planning efforts statewide post-Katrina/Rita and acquisition through Programs such as Road Home	Change in NFIP results into high premium for flood Insurance.	 Federal- State
<b>Acquisition And Private Property Rights Issues</b>	Coastal project on land owned by federal government	Coastal projects on land owned by state government.	Federal, state and privately owned land cause difficulty in implementing coastal restoration projects.	 Federal, State, Local vs. Private property owner

### ***3. Dredging and Diversion: The Preferred Method for Restoration***

#### *Problem Definition*

According to the coastal practitioners and experts interviewed, there is a consensus on executing reasonably-sized sediment and freshwater diversion project to impersonate the natural delta building characteristics of the river (as proposed in the Coastal Master Plan 2012). However, Parish government believes such diversions can impair the livelihood of numerous fishermen in the area. The problem defined here is related to what is the preferred method of coastal restoration in Plaquemines Parish.

#### *Criteria for Choosing Plan Element: Dredging and Diversion*

- Involves federal, state and local level government agencies in the decision-making process.
- This element has a large impact not only on the Parish but also on the entire Gulf Coast.
- The focus is related to coastal restoration.

#### *Assembling Evidence*

- Review of State Coastal Master Plan;
- The PPSIP;
- CZMP;
- Plaquemines Parish Comprehensive Master Plan.

#### *Policy Outcomes*

Some of the crucial issues with intergovernmental coordination related to dredging and diversions in Plaquemines Parish are discussed in detail in Table 6.3. Plan review indicates non-alignment in decision regarding the preferred method of coastal restoration between the state and local Parish government.

### *Dredging and Diversion:*

Although there is an overall discussion for reasonably-sized sediment and freshwater diversion projects, Parish level government favors dredging and beneficial use of dredged material for coastal restoration locally. First, according to the Parish, dredging and beneficial use of dredged material is believed to be an instant marsh creation method. Secondly, unlike diversions, it involves much less displacement of critical wetland habitat (e.g. oyster beds). However, in the diversion method, it is significant to note that each location of the proposed diversion is completely different from others because of the unique geography and potential ponding area in the region. Therefore, the coastal engineers interviewed in this research agreed that the size and location of the diversions should be studied and engineered in such a way that considers as many relevant factors as possible. Practitioners also believed that over the course of years, sediment and freshwater diversions will prove themselves the most-suitable way to restore coastal land. Coastal engineer interviewed from Plaquemines Parish said, “I am in favor of diversion because they are an attempt to allow the Mississippi River to act as it has in its natural state.” Although diversions (according to the Coastal Master Plan) undoubtedly build land over the course of their operation, it is also likely to take over a decade to design and permit a properly functioning diversion. Additionally, years would be required to construct the necessary infrastructure and even more decades to actually see the benefits. Interviews with the policy beneficiaries (mainly fishermen) indicate disappointment regarding the large-scale diversion projects proposed in the Coastal Master Plan. Fishermen interviewed believed “there is no value of large-scale diversions in building coastlines. The Caernarvon diversion (built in 1991) on the east bank has failed miserably to build projected acres of land.” While technically true, the perception of a failed Caernarvon diversion is flawed as a diversion was constructed to maintain salinity in the estuary rather than to build land. This misperception fuels local opinions, including that of P.J. Hahn, Director of coastal programs of Plaquemines, who is quoted as saying that the “Master Plan should instead adopt the Parish Restoration Plan, which calls for a series of much smaller diversions and the purchase of a dredge that could be dedicated to rebuilding of the marshes” (Schleifstein 2012). Clearly, a non-alignment between state and local government is



observed that fails to address the problem of land loss holistically. Therefore, a conflict between diversion projects and oyster beds is an example of economic displacement that must be anticipated and factored into long-range planning.

According to the Parish, dredging and manually creating wetlands using dredge material can immediately respond to the situation of land loss and help rebuild wetlands and barrier islands. After much discussion, in 2014 the U.S. Army Corps of Engineers (US ACE) and Parish signed a partnership agreement for the initiation of the LCA Beneficial Use of Dredged Material agreement to use dredge spoils in coastal restoration projects. According to this agreement, the US ACE and the Parish will design the first marsh creation under this program and proceed with construction on availability of funding in 2015. This program indicates cooperation between the Parish and US ACE.

#### *Cost Effectiveness:*

According to the Parish government, dredging activity will be able to bring sediments that can be carried through pipelines. The material will be used in certain areas for restoration practice. However, the state government argues that the dredging process is expensive and has never been a feasible option for restoring land.

#### *Findings*








This section summarizes the finding from the existing plan outcome. Some of the key findings are:

- Conflict between two methods of restoring the coast. State proposes multiple freshwater diversion projects and the local government supports dredging as the preferred method of restoration; A constant conflict between state and local government is observed regarding which method would be preferred by the both level of government;
- Cost effectiveness of both the above-mentioned methods for coastal restoration is also a point of discourse between the two levels of government.

### *Implication of the Findings on Adaptive Management*

Through literature review, it has been observed that the coastal environment is extremely dynamic and complex. Therefore, there is a need to understand the state of the environmental system while developing the coastal restoration projects. Additionally there appeared a need of prognosis of future development and calibrated measures to address the problems. Introduction of adaptive management as a monitoring tool through CWPPRA and LCA was a critical effort by the state government towards an action that can resolve the conflict caused due to two prevalent methods of restoration (ie. sediment diversion and sediment dredging). The process of adaptive management therefore can provide information from the past changes and help the local and the state governments predict and develop future management decisions.

**Table 6.3 Dredging and Diversion Summary**

<b>Items</b>	<b>Federal (CZMA, CWPPRA)</b>	<b>State (Coastal Master Plan 2012)</b>	<b>Local (CZMP, PSSIP and Plaquemines Master Plan)</b>	<b>Conflict  Coordination </b>
<b>Diversion</b>	Supports Diversion and State Coastal Master Plan. Therefore, funding was allotted to the State Plan.	It proposed Diversion projects all across Louisiana.	Supports small-scale diversion.	 State-Local  Federal-Local
<b>Dredging</b>	USACE signed a partnership agreement with Plaquemines Parish in order to initiate LCA Beneficial use of dredged material on availability of funding in 2015.	Although the State Master Plans proposed \$2.2 billion on a series of diversion projects, the plan also has provision for creating marshland in the area by dredging and pumping of sediments.	Supports are dredging as the preferred method of restoring the coast. The local restoration plans involve a long term lease of dredging equipment that would pump sediments from the Mississippi River through pipes across the levee and then create vegetation in the area.	 State-Local
<b>Cost effectiveness of the preferred method</b>	The federal government funds either of the methods.	Diversion: Diversion projects are cost effective and feasible at the present funding scenario.	Dredging: Extremely expensive and not feasible for funding.	 State- local
<b>Implementation</b>	-	Diversion: Diversion projects are still possible with the piecemeal funding.	Dredging: Extremely time- consuming and not possible with piecemeal funding due to the need to initiate new pipelines for each project as a separate contract.	 State- Local

#### **4. Funding and Implementation of Plans**

##### *Problem Definition*

In order to have federal, state and local agencies meet targeted wetland acreage gains, there needs to be a certain reasonable amount of assured funding; this is lacking. It has been assessed that such unavailability of funding has caused some local governments to deter from the wetland restoration initiative.

##### *Criteria for Choosing Plan Element: Funding and Implementation*

- Involves federal, state and local level government in the decision-making process.
- This element has a large impact not only on the Parish but also on the entire Gulf Coast.

##### *Assembling Evidence*

- Plaquemines Parish Comprehensive Master Plan;
- State Coastal Master Plan 2012;
- Newspaper articles;
- Clean Water Act.
- Stakeholder interviews

##### *Policy Outcomes*

##### *Funding*

The conflict lies in the fact that local government receives monies in fraction that is diminutive to operationalize the coastal projects. Lack of assured funding source and coordination (on the part of higher-level government) results in loss of interest in coastal restoration efforts at the state and local level.

##### *Implementation Strategy*

There are two types of coastal protection implementation strategies in South Louisiana. The first one being structural measures that include floodwalls, levees, etc. to reduce flooding hazards risk to developed property. Second are the non-structural measures like multiple lines of defense (that includes both structural and non-structural methods), property protection, emergency services and public information. There is coordination observed between the state

and local level government in terms of adopting non-structural measure for the restoration. The local PPSIP is in line with the CPRA's Multiple Lines of Defense strategy.

### *Findings*

Some of the key findings from the assessing the funding and implementation focus of the coastal plan are:

- *Funding:* The federal government through CWPPRA will be able to fund a portion of the Master Plan project in the year 2017. Additionally, offshore oil revenue is another source of funding that will contribute approximately \$250 million per year. The funding available through the state Restoration Act (State CZMP) is used in federal/state cost-share agreement. The conflict lies in the fact that local government receives monies in fraction that is diminutive to operationalize the coastal projects. Lack of assured funding source and coordination (on the part of higher-level government) results in loss of interest in coastal restoration efforts at the state and local level;






To compound the problem of funding, the approval and permitting process (CUPs) is extremely time-consuming that causes delayed implementation of the projects;

- *Implementation Strategy:* The state and local level government coordinates in terms of adopting non-structural measure for the restoration. The local PPSIP is in line with the CPRA's Multiple Lines of Defense strategy.

### *Implication of Findings on Adaptive Management*

Intergovernmental coordination in the funding and implementation process indirectly promotes implementation and practice of adaptive management. Finding funds for long term monitoring or adaptive management projects in the current scenario is extremely challenging.

**Table 6.4 Funding and Implementation Strategy Summary**

Items	Federal (CZMA, CWPPRA)	State (Coastal Master Plan 2012)	Local (CZMP, PPSIP and Plaquemines Master Plan)	Conflicts  Coordination 
<b>Funding</b>	CWPPRA will be able fund portion of the Master Plan project in the year 2017. Offshore oil revenue is another source of funding that will contribute approximately \$200 million- \$300 million per year.	The funding available through the state Restoration Act (State CZMP) is used in federal/state cost-share agreement (75% federal and 25% state) for CWPPRA project.  Fines form 2010 Deepwater Oil Spill due to violation of Clean Water Act	Local government receives money in fractions. Coastal Directors interviewed in the data collection phase believe that most of the federal funding gets lost at the state level leaving none for the local government coastal planning projects.	 Federal- State  State-Local
<b>Implementation Strategies</b>	-	Non-structural method of restoration: Multiple Lines of defense strategy to achieve sustainable coast	Local government is in line with the state government restoration measure of non-structural method. Objective of PPSIP is also formulated on the Multiple Lines of Defense strategy.  PPSIP is consistent with the state Coastal Master Plan.	 State- local

### *Institutional Issues and Federal Consistency Provision*

According to the literature review and results presented here, there are numerous institutional issues, such as government funding, land and water resource management and other related regulations that make large-scale coastal restoration difficult. There are numerous federal, state and local programs that can have impacts on the wetlands. In the past, there has been researching and governmental effort to align these programs to a common goal. But to date none of them were comprehensive and effective. For example (as noted in chapter 4), consistency among certain uses of coastal Louisiana's resources is a requirement addressed in the CZMA, Section 303 (d). The Act requires:

*Implementing, maintaining, modifying, or rehabilitating navigation, flood control or irrigation projects, other than emergency actions under other authorities, the Secretary, U.S. Army Corp of Engineers [USACE] in consultation with the Director (U.S. Fish and Wildlife Service) and the Administrator [USEPA], shall ensure that such actions are consistent with the purposes of the restoration plan submitted pursuant to this section. (as quoted in Coast2050 1998).*

The above quoted section is one of the most important requirements through the consistency provision of the CZMA; my finding is that there was no procedural guidance by the state carry out the consistency requirement in Louisiana until the development of the statewide Coastal Master Plan. While developing the coastal zone regulations, the state had many opportunities to interject its independent rules and regulations. However for the state level plan to get approved, the state must provide federal agencies an opportunity to participate in its development.

Although Jessen (2007) and Martin et al. (2003) argue that Louisiana should use federal consistency aggressively, it should also be realized that Louisiana may encounter numerous obstacles in the process. Some such obstacles include i) resistance from the oil and gas companies who enjoy state governments' political support; ii) conflict between Louisiana administration and Congressional intent; iii) ineffective administration of the CZMA by the State, as there is the inability of the federal government authority to force Louisiana into action; and, iv) statutory language in the plan varies from one state to another, and thus can assume

different intents simultaneously (Jessen 2007). It has been found that in Louisiana, the Comprehensive Master Plan has a broader pro-development slant in its language that accommodates as much development as possible while is also calling for large-scale coastal restoration.

In 2007 Louisiana used its authority under the CZMA to threaten to block future oil and gas lease sales in order to receive a larger share of the federal revenue from the oil and gas companies to restore the coastline (Jessen 2007). Obstacles related to financial constraints, political roadblocks and negative judicial precedent certainly exist in Louisiana.

### *Linking Collaborative Governance to Adaptive Management*

Analysis of the four plan focus area and the consistency provision of CZMA indicate several instances of intergovernmental conflicts in the decision-making and planning process. Intergovernmental coordination and collaborative governance are crucial for the practice of adaptive management (Folke et. al 2005). Through the literature review it has been observed that addressing environmental and coastal resource management issues requires coordinated actions across all jurisdictional levels, ongoing learning and capacity to alter the course of action in response to new knowledge gained. With the engagement of multiple public-sectors, nonprofits and private sector agencies, decision making in the coastal planning process faces numerous challenges. Environmental management can be made efficient by converging collaborative decision making and adaptive management. Convergence of collaborative governance with adaptive management act as a middle ground for science and decision making, greater public engagement in knowledge building and consequently improving policy outcomes.

Realities associated with collaborative adaptive management are social complexity, diversity in ideas and conflicts that arise from it. Kai Lee notes “conflict is a central reason that adaptive management has had more influence as an idea than as a way of doing conservation.” (1999:4). On the other hand, institutional challenges are the key barrier to the implementation of



adaptive management. Although there have been increased attempts to structure collaborative governance with adaptive management, many factors have impeded successful application. Some of the major challenges are i) limited funding, ii) institutional and legal constraints that limit capacity to take risk and to alter course of action, iii) time constraints, iv) insufficient coordination among all levels of government, scientist, stakeholders and managers in development of adaptive management of plans and its implementation.

However, from the findings in the Chapter VI it is evident that by linking intergovernmental coordination with adaptive management, there is a strong possibility of understanding the pathway for effective coastal planning.

## Chapter VII

### Discussion and Conclusion

The scope of this thesis was to assess intergovernmental conflict in four focus areas of the existing coastal restoration plans and study how presence of intergovernmental coordination or collaborative governance can result in improved adaptive management. The three point objective of, i) investigating critical coastal restoration plans at all levels of government; ii) Analyzing coordination and conflicts in four plan focus areas and iii) provide recommendation on how collaborative governance can make the process of adaptive management effective has been discussed in chapter IV and VI of this study. This chapter also lists recommendations that will attempt to accomplish the third research objective. These recommendations are specific to coastal Louisiana and the major coastal restoration plans, drawing on particular weaknesses of intergovernmental relationship noted in the plan assessment section of this thesis. The recommendation or policy alternatives listed below draw upon the literature review and findings of intergovernmental coordination in plan assessment.

#### *Recommendations*

The following recommendations can be presented based on the findings of this study. All levels of government and environmental agencies responsible for the protection of coastal land need to work on a multi-pronged coordinated approach that includes certain long- and short-term objectives.

- 1) *Preferred Method for Coastal Restoration in Plaquemines Parish*: A two-fold approach towards restoration should be adopted that consist of both the methods of sediment dredging and Mississippi River diversions.
- 2) *Coastal Use Permit (CUP)*: Timely and efficient response from the restoration project reviewing agency is lacking. Project applicants who apply for CUPs reported that the

response from the reviewing agencies does not have a set deadline, which often leads to failure in meeting the project schedules. The practitioners who were a part of this research interview mentioned that the permitting process in the coastal zone is typically lengthy and can cause significant delay in project implementation.

- 3) *Water Resource Management:* Maintaining water quality is a crucial criterion in the water resource management. It is important to promulgate regulations that govern all major development activities on the Mississippi River and adjacent property, which may have detrimental impacts on coastal restoration efforts. These potential impacts and major projects may hamper downstream needs and could be reviewed and approved by LDEQ. LDEQ plays a major role in Louisiana's Non-point Source Management Plan, which is in concurrence with the CWA water quality standards. It is recommended to develop wetland-specific water quality standards in Louisiana that would be used to certify any discharge permits to the coastal wetlands.
- 4) *Funding:* Current funding available for the coastal area (wetland) preservation and restoration is too little, and extremely time-consuming to procure. Project applicants are, therefore, deterred from applying or seriously pursuing any restoration projects due to a lack of the sufficient funding needed to complete such projects.
- 5) *Implementation:* Delay in reviewing the permits by the agencies has led to applicants missing project funding deadlines. It is, therefore, critical to making all governmental agencies coordinate together and have a streamlined, efficient and time-bound review process. It would probably require full-time additional staff in some of the agencies that otherwise have certifying officers working on multiple projects at the same time delaying the overall implementation of the projects. Government officials believe that there is very little coordination in implementing restoration projects. Due to a shortage of funding, individual parish budgets are rarely able to support coastal restorations projects of the

size required, therefore projects that are undertaken solely by the parish are typically of the size and scale that only affect the parish in question.

- 6) *Use of consistency provision of CZMA:* Apart from restricting harmful development in the coastal zone, the state can also impose stringent regulations (for instance wetland-specific water quality standards under CWA) when it chooses to issue CUPs and licenses.
- 7) *Land use:* there is a necessity for a greater role of regional and state engagement in land use decisions. Apart from that, existing zoning laws should be developed and enforced, and new practices like transfer of development rights (TDR) and Low Impact Development (LID) should be adopted to reduce the risk.
- 8) *Adaptive Management:* Finally, convergence of collaborative governance with adaptive management act as a middle ground for science and decision making, greater public engagement in knowledge building and consequently improving policy outcomes.

### *Conclusion*

The nature of the coast can be described as complex and evolving. As previously stated in this thesis, such attributes point towards a process of adaptive and collaborative management as an extremely useful decision making framework. In order to fill the gaps in the qualitative literature, preliminary review of coastal restoration Acts/Plans was performed. By reviewing federal, state and especially local level coastal plans; this research followed the bottoms-up approach in understanding coordination and conflicts at various levels of government. The research also identified and discussed what Lowry mentioned as “implementation gap” or inconsistency in translation of a particular policy into specific action. Finally, studying both the theory of collaborative governance and adaptive management provided an enhanced understanding of an innovative decision making framework of “adaptive governance.” Thus, adaptive governance for coastal Louisiana must be seen as a part of an environmental resource management technique that can satisfy the competing demands posed upon the system under current institutional arrangement and political condition.

## Bibliography

1987. California Coastal Commission, et al., Appellants, v. Granite Rock Company. U.S. Supreme Court.
- Adelson, Jeff. 2013. "Jefferson, Plaquemines file coastal erosion lawsuits against oil, gas companies." *The Advocate*. <http://theadvocate.com/news/7566666-123/jefferson-and-plaquemines-file-coastal>.
- Allsopp, Michelle, Adam Walters, David Santillo, and Paul Johnston. 2006. *Plastic Debris in the World's Oceans*. Amsterdam, Netherlands: Greenpeace.
- Bardach, Eugene. 2011. *A Practical Guide for Policy Analysis: The Eightfold Path to More Effective Problem Solving*. 4th ed. Thousand Oaks, CA: CQ Press College.
- Barras, J., S. Beville, D. Britsch, S. Hartley, S. Hawes, J. Johnston, P. Kemp, Q. Kinler, A. Martucci, J. Porthouse, D. Reed, K. Roy, S. Sapkota, and J. Suhayda. 2004. Historical and projected coastal Louisiana land changes: 1978-2050. In *Open File Report 03-334*: U.S. Geologic Survey
- Barras, John A. 2007. "Land area changes in coastal Louisiana after Hurricanes Katrina and Rita." In *Science and the Storms—the USGS Response to the Hurricanes of 2005*, edited by G.S. Farris, G.J. Smith, M.P. Crane, C.R. Demas, L.L. Robbins and D.L. Lavoie, 283.
- Beatley, Timothy, David J. Brower, and Anna Schwab. 2002. *An Introduction to Coastal Zone Management*. 2nd ed. Washington DC: Island Press.
- Berke, Philip, and Maria Manta Conroy. 2000. "Are We Planning for Sustainable Development? An Evaluation of 30 Comprehensive Plans." *Journal of the American Planning Association* 66 (1):21-33.
- Berke, Philip, Dale J. Roesnigk, Edward J. Kaiser, and Raymond J. Burby. 1996. "Enhancing Plan Quality: Evaluating the Role of State Planning Mandates for Natural Hazard Mitigation." *Journal of Environmental Planning and Management* 39 (1):79-96.
- BOEMRE. 2010. *Coastal Impact Assistance Program State Plan and Plan Amendment Guidelines*. Washington DC: U.S. Department of the Interior, Bureau of Energy Management, Regulation, and Enforcement.
- Bordeau, John, Mark English, and Paul Pohne. 2013. *Loss Avoidance Study, Plaquemines Parish, Louisiana*. edited by Joint Field Office Federal emergency Management Agency. Baton Rouge, LA.
- Bryant, Dirk, Eric Rodenburg, Tara Cox, and Daniel Nielsen. 1995. *Coastlines at risk: An index of potential development-related threats to coastal ecosystems*. Washington DC: World Resources Institute.
- Bunnell, Gene, and Edward J. Jepson. 2011. "The Effect of Mandated Planning on Plan Quality: A Fresh Look at What Makes "A Good Plan"." *Journal of the American Planning Association* 77 (4):17.

- Burby, Raymond J., and Linda C. Dalton. 1994. "Plans can matter! The Role of Land Use Plans and State Planning Mandates in Limiting the Development of Hazardous Areas." *Public Administration Review* 54 (3):9.
- Burby, Raymond J., and Peter J May. 1997. *Making Governments Plan: State Experiments in Managing Land Use*. Baltimore: Johns Hopkins University Press.
- Burby, Raymond J., and Peter J. May. 1998. "Intergovernmental Environmental Planning: Addressing the Commitment Conundrum." *Journal of Environmental Planning and Management* 41 (1):95-110.
- Burkett, Virginia R., David B. Zilkoski, and David A. Hart. 2003. "Sea-Level Rise and Subsidence: Implications for Flooding in New Orleans, Louisiana." U.S. Geological Survey Subsidence Interest Group Conference, Galveston, TX, November 27-29, 2001.
- Burley, David, Sara Crosby, and T. Mayheart Dardar. 2010. *Losing Ground : Identity and Land Loss in Coastal Louisiana*. Jackson, MS: University Press of Mississippi
- Couvillion, B.R., J.A. Barras, G.D. Steyer, William Sleavin, Michelle Fischer, Holly Beck, Nadine Trahan, Brad Griffin, and David Heckman. 2011. Land area change in coastal Louisiana from 1932 to 2010. U.S. Geological Survey.
- CPRA. 2012. Louisiana's Comprehensive Master Plan for a Sustainable Coast. edited by Coastal Protection and Restoration Authority of the State of Louisiana. Baton Rouge, LA.
- Creel, Liz. 2003. "Coastal Zones Under Pressure: Integrated Coastal Management and the Demographic Dimension." 13th Biennial NOAA Coastal Zone Conference Baltimore, MD.
- Davis-Wheeler, Clare. 2013. "Title." *The Louisiana Environment*.
- Day, J., D. Boesch, E. Clairain, G. Kemp, S. Laska, W. Mitsch, K. Orth, H. Mashriqui, D. Reed, L. Shabman, C. Simenstad, B. Streever, R. Twilley, C. Watson, J. Wells, and D. Whigham. 2007. "Restoration of the Mississippi Delta: Lessons from Hurricanes Katrina and Rita." *Science* 315:1679-1684.
- DNR, LA. 2008. Louisiana Coastal Facts. Baton Rouge, LA: Louisiana Department of Natural Resources.
- Eliopoulos, Phoebe A. 1982. *Coastal Zone Management: Program at a Crossroads*. Issue 30 of Environment reporter: Monograph ed: Bureau of National Affairs.
- Evans-Graves Engineers. 2013. Coastal Zone Management update to the Plaquemines Parish Coastal Zone Management Program. Metairie, LA: Plaquemines parish Department of Coastal Management.
- FEMA. 2014. Policy Statistics in effect on report "AS OF" 07/31/2014.
- Folke, Carl, Thomas Hahn, Per Olsson, and Jon Norberg. 2005. "Adaptive Governance of Social-Ecological Systems.." *Annual Review of Environmental Resources* 30:32.
- Gagliano, Sherwood. 2005. "Effects of natural fault movement on the land submergence in coastal Louisiana." 14th Biennial Coastal Zone Conference, New Orleans, LA.
- Gagliano, Sherwood, Benjamin Guempel, William Kappel, Karen Wicker, and Josph Suhayda. 2008. Plaquemines Parish Strategic Implementation Plan, 2008. Belle Chasse, LA: Plaquemines Parish President & Council.

- Gagliano, Sherwood M., E. Burton Kemp III, Karen E. Wicker, Kathleen S. Wiltenmuth, and Robert W. Sabate. 2003. "Neo-Tectonic Framework of Southeast Louisiana and Applications to Coastal Restoration." Gulf Coast Association of Geological Societies Convention, Baton Rouge, LA.
- Galloway, Gerald. 2006. "Restoring Coastal Louisiana: Planning Without a National Water Policy." *The Bridge*, 43-49.
- Gerlak, Andrea K. 2003. "Federalism and U.S. Water Policy: Lessons for the Twenty-First Century." *The Journal of Federalism* 36 (2):231-257.
- Gerlak, Andrea K., and Tanya Heikkila. 2006. "Comparing Collaborative Mechanisms in Large-Scale Ecosystem Governance." *Natural Resources Journal* 46 (3):657 - 707
- Gillham, Bill. 2000. *Case Study Research Methods*. New York, NY: Bloomsbury Publishing.
- GNO Inc. 2010. A Study of the Economic Impact of the Deepwater Horizon Oil Spil. New Orleans, LA: Greater New Orleans Inc..
- Godschalk, David R. 1992. "Implementing coastal zone management: 1972–1990." *Coastal Management* 20:23.
- Groves, David G., Christopher Sharon, and Debra Knopman. 2013. Planning Tool to Support Louisiana's Decisionmaking on Coastal Protection and Restoration. edited by Rand Gulf States Policy Institute. Santa Monica, CA: Coastal Protection and Restoration Authority of the State of Louisiana.
- Hahn, P.J. 2013. "Plaquemines offers plan to reestablish the Cat Islands." *Focus On Plaquemines* <http://www.plaqueminesparish.com/coastal-newsletters/July2013.pdf>.
- Hale, Lynne Zeitlin. 2000. Achieving Integration in Coastal Management: The challenge of Linking National and Local Levels of Government. *Korea Observer* 30 (4).
- Hanushek, Eric, and John Quigley. 1990. "Commercial Land Use Regulation and Local Government Finance." *American Economic Review* 19 (2):4.
- Herbert, Marc C. 1997. "Coastal Restoration Under CWPPRA and Property Rights Issues " *Louisiana Law Review* 57 (4):1165.
- Hershman, Marc. 1975. "Achieving Federal-State Coordination in Coastal Resources Management." *William & Mary Law Review* 16 (4).
- Hershman, Marc, and James Folkenroth. 1975. "Coastal Zone Management and Intergovernmental Coordination." *Oregon Law Review* 54:20.
- Holling, C.S. 1978. *Adaptive environmental assessment and management* Edited by International Institute for Applied Systems Analysis. Chichester, NY: Wiley
- Houston, J.R., and R.G. Dean. 2011. "Sea-level acceleration based on U.S. tide gauges and extensions of previous global-gauge analyses." *Journal of Coastal Research* 27 (3):8.
- Institute, Environmental Law. 2008. State Wetland Protection: Status, Trends & Model Approaches. Washington DC: Environmental Law Institute.
- IPCC. 2014. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change edited by C.B. Field, V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada,

- R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White. New York, NY.
- Jessen, Andrew S.. 2007. "Louisiana and the Coastal Zone Management Act in the wake of Hurricane Katrina: a renewed advocacy for a more aggressive use of the consistency provision to protect and restore coastal wetlands." *Ocean and Coastal Law Journal* 12 (1).
- Johnston, Christopher. 2014. "Title." *Environmental Journalist*.  
<http://www.christopherjohnston.com/plaquemines-parish-dying-oysters/>.
- Jordan, Jillian, and Edmond Mouton. 2010. Coastwide Nutria Control Program 2009-2010: Nutria Harvest and Distribution and a Survey of Nutria Herbivory Damage in Coastal Louisiana Baton Rouge, La: Louisiana Department of Wildlife and Fisheries.
- Kaiser, Edward J., and David R. Godschalk. 1995. "Twentieth Century Land Use Planning." *Journal of the American Planning Association* 61 (3):365-386.
- Khandekar, Madhav. 2009. "Global warming and sea-level rise " *Energy & Environment* 20 (7):9.
- Kincaid, John. 1996. "Intergovernmental Costs and Coordination of U.S Environmental Protection." In *Federalism and the Environment: Environmental Policymaking in Australia, Canada and United States*, edited by Kenneth Holland, F.L. Morton and Brian Galligan, 79-102. Westport, CT: Greenwood Press.
- Koontz, Tomas M. 2005. "We Finished the Plan, So Now What? Impacts of Collaborative Stakeholder Participation on Land Use Policy." *Policy Studies Journal* 33 (3):459-480.
- Kusler, Joy A. 1980. *Regulating Sensitive Lands*. Cambridge, MA: Ballinger.
- Lee, K. N. 1999. Appraising adaptive management. *Conservation Ecology* 3(2):3.  
<http://dx.doi.org/10.1201/978-1420042597.sec1>
- LAGIC. 2006. 2005 Louisiana Hurricane Impact Atlas, Volume 1. Baton Rouge, LA: Louisiana Graphic Information Center.
- LCWCR Task Force. 1998. Coast 2050: Toward a Sustainable Coastal Louisiana. Baton Rouge, LA: Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority.
- Lowry, Kem. 2007. "Designing Decentralized Coastal Management Programs." In *Decentralizing Governance*, edited by Shabbir Cheema and Dennis Rondinelli. Washington DC: The Brookings Institute.
- Lowry, Kem, and Tim Eichenberg. 1986. "Assessing Intergovernmental Coordination in Coastal Zone Management." *Policy Studies Review* 6 (2):9.
- Marshall, Bob. 2011. "Diverted Mississippi River waters spell doom for Louisiana oysters." *Times- Picayune*, 5/11/2011.
- Martin, Christopher. 1991. "The Use of the CZMA Consistency Provision to Preserve and Restore the Coastal Zone in Louisiana." *Louisiana Law Review* 51 (4):25.
- Martin, Deborah, Eugene McCann, and Mark Purcell. 2003. "Space, Scale, Governance, and Representation: Contemporary Geographical Perspectives on Urban Politics and Policy." *Journal of Urban Affairs* 25:113-121.



- May, Peter J., Raymond J. Burby, Neil J. Ericksen, John W. Handmer, Jennifer E. Dixon, Sarah Michaels, and D. Ingles Smith, eds. 1996. *Environmental Management and Governance: Intergovernmental Approaches to Hazards and Sustainability*. London: Routledge.
- Mcguire, Chad J. 2012. "Coastal Planning, Federal Consistency, and Climate Change: A Recent Divergence of Federal and State Interests." *Natural Resources & Environment* 27 (1).
- Meehl, G.A., T.F. Stocker, W.D. Collins, P. Friedlingstein, A.T. Gaye, J.M. Gregory, A. Kitoh, R. Knutti, J.M. Murphy, A. Noda, S.C.B. Raper, I.G. Watterson, A.J. Weaver, and Z.-C. Zhao. 2007. "Global Climate Projections." In *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller. Cambridge, UK and New York, NY: Cambridge University Press.
- Merton, R.K., M. Fiske, and P.L. Kendall. 1990. *The focused interview: A manual of problems and procedures*. Glencoe IL: The Free Press.
- Morton, Robert A., Julie C. Bernier, John A. Barras, and Nicholas F. Ferina. 2005. "Historical Subsidence and Wetland Loss in the Mississippi Delta Plain." *Gulf Coast Association of Geological Societies Transactions* 55:17.
- Nance, Earthea. 2011. "Governance." In *In Increasing National Resilience to Hazards and Disasters, The Perspective from the Gulf Coast of Louisiana and Mississippi: Summary of A Workshop*, edited by Steve Olson. Washington DC: National Academies Press.
- Nance, Earthea, and Leonard Ortolano. 2007. "Putting Participation in context: An Evaluation of Urban Sanitation in Brazil, A Dissertation." *Journal of Planning and Education Research* 26:16.
- NAS. 2013. Assessing impacts of the Deepwater Horizon oil spill in the Gulf of Mexico. *ScienceDaily*.
- NOAA, (National Oceanographic and Atmospheric Association). 2005. Hurricane Katrina. National Climatic Data Center.
- Norton, Richard K. 2005. "Striking a Balance Between Environment and Economy in Coastal North Carolina." *Journal of Environmental Planning and Management* 48 (2):177-207.
- NRC. 2004. *U.S. Army Corps of Engineers Water Resources Planning: A New Opportunity for Service*. Edited by Committee to Assess the U.S. Army Corps of Engineers Methods of Analysis and Peer Review for Water Resources Project Planning Water Science and Technology Board, Coordinating Committee, Ocean Studies Board, Division on Earth and Life Studies, National Research Council. Washington DC: National Academies Press.
- NRC. 2008. *First Report from the NRC Committee on the Review of the Louisiana Coastal Protection and Restoration (LACPR) Program*. Washington DC: The National Academies Press.
- Peyronnin, Natalie, Mandy Green, Carol Parsons Richards, Alaina Owens, Denise J. Reed, Joanne Chamberlain, David G. Groves, William K. Rhinehart, and Karim Belhadjali. 2013. "Louisiana's 2012 Coastal Master Plan: Overview of a Science-Based and Publicly

- Informed Decision-Making Process." *Journal of Coastal Research* (Special Issue, Louisiana's 2012 Coastal Master Plan Technical Analysis, no. 67):15.
- Plaquemines Parish. 2013. *Plaquemines Parish Comprehensive Master Plan*. Belle Chasse, LA.
- Platt, Rutherford H. 2004. *Land Use and Society: Geography, Law, and Public Policy*. Washington D.C.: Island Press.
- Rabalais, Nancy. 2002. "Nitrogen in Aquatic Ecosystems." *Ambio* 31 (2):10.
- Reed, Denise, and Lee Wilson. 2004. "Coast 2050: A New Approach to Restoration of Louisiana Coastal Wetlands." *Physical Geography* 25 (1):17.
- Rubin, Herbert, and Irene Rubin. 2012. *Qualitative Interviewing: The Art of Hearing Data*. Thousand Oaks, CA: Sage Publications.
- Saikkku, Mikko. 2006. "The Federal Government and Flood Control in the Lower Mississippi Valley." *American Studies in Scandanavia* 38 (2):11.
- Sale, Kirkpatrick. 1993. *The Green Revolution: The American Environmental Movement*. New York, NY: Hill and Wang.
- Schleifstein, Mark. 2012. "Fishers say coastal master plan could destroy their livelihoods." *Times-Picayune*.  
[http://www.nola.com/environment/index.ssf/2012/01/fishermen\\_object\\_to\\_large\\_diver.html](http://www.nola.com/environment/index.ssf/2012/01/fishermen_object_to_large_diver.html).
- Stake, Robert. 2005. "Qualitative Case Studies." In *Handbook of Qualitative Research*, edited by N.K. Denzin and Y.S. Lincoln. Thousand Oaks, CA: Sage Publishing.
- Stankey, George H, Roger N Clark, and Bernard T Bormann. 2005. Adaptive management of natural resources: theory, concepts, and management institutions. In *General Technical Report PNW-GTR-654*. Pacific Northwest Research Station U.S. Department of Agriculture, Forest Service
- Stratton Commission. 1969. *Our Nation and the Sea. A Plan for National Action*. Report of the Commission on Marine Science, Engineering and Resources. Washington DC: United States Government Printing Office
- Strauss, Benjamin H. 2013. "Rapid accumulation of committed sea-level rise from global warming." *Proceedings of the National Academy of Sciences* 110 (34).
- Tidwell, Mike. 2003. *Bayou Farewell*. New York, NY: Vintage Books
- USACE, LDEQ. 2004. *Louisiana Coastal Area (LCA), Louisiana: Ecosystem Restoration Study*. New Orleans, LA: US Army Corps of Engineers, Louisiana Department of Environmental Quality.
- Weitz, Jerry. 1999. "From Quiet Revolution to Smart Growth: State Growth Management Programs, 1960 to 1999." *Journal of Planning Literature* 14 (2):267-337.
- Wold, Amy. 2013. "DNR OKs permit for coal export terminal in Plaquemines Parish." *The Advocate*, 9/1/13. <http://theadvocate.com/home/6914389-125/dnr-oks-permit-for-coal>.
- Yin, Robert K. 2003. *Case Study Research: Design and Methods, 3rd Edition*. Thousand Oaks: Sage Publications.

## Appendix A

### **Major Causes of Coastal Land Loss in Louisiana and Plaquemines Parish**

Rapid coastal land loss in Louisiana and Plaquemines Parish is occurring due to multiple reasons.

#### *Altered Hydrology in Mississippi River Delta*

Historically, land building and loss were entirely the results of sediment deposition and subsidence dictated by the shifting course of the Mississippi River (Burley 2010). Prior to the leveeing of the Mississippi River, the course of the river shifted approximately every 1,000-1,500 years, creating the low-lying landscape we recognize today. The sediments brought in by the river provided a fertile environment and produced an elevation for the wetlands over the deltaic plain. Hence, under natural conditions the Mississippi River drained water and sediments into the Gulf of Mexico through channels, providing the nutrients and sediments necessary for the wetland growth and elevation (Reed and Wilson 2004). Natural change in course of the Mississippi River has historically caused the sediments to be deposited in the shallow water resulting in wetland increase and poor wetlands growth in areas of channel abandonment (Morton et al. 2005).

#### *The Altered System: River Levees*

In the altered system, construction of massive artificial levees along the Mississippi River Delta is the main form of anthropogenic disturbance to the coastal marshes. The purpose of these levees is to reduce springtime floods and facilitate navigation. Studies show that the construction of dams and levees intended to protect the cities and parishes from flooding prevented the coastal wetlands from receiving the needed nutrient-rich water, and sediments previously brought in by the river (Reed and Wilson 2004). Due to channelization of the river through construction of the levees, a significant portion of these sediments, rich in phosphorus and nitrogen, accumulates further away from the delta, into the deep waters of the Gulf of Mexico. Two major consequences of leveeing the river are therefore: 1) loss of inorganic sediments from natural flooding of the river: the reason the land cannot build as fast as it is subsiding—and, as a result relative sea level rise (Reed and Wilson 2004): and 2) the nitrogen and phosphorous flowing from the river contribute to the development of low-oxygen zones in the Gulf of Mexico known as dead zones. Due to reduced oxygen level in the water from micro organism feeding on the nutrients and utilizing the oxygen, these areas fail to support large sea life and rapidly disrupts the marine ecosystems (Rabalais 2002).

### *Navigational Canals*

There are ten major navigational canals connecting the Gulf of Mexico to inland Louisiana ports. Studies indicate that the presence of these canals facilitates salt water intrusion into the fresh water marshes especially during storm surge (Reed and Wilson 2004). Dredging of straight canals in areas previously having natural meandering channels accelerates the speed of storm surge and tidal action, causing destruction of the healthy wetlands. Additionally, canals with high banks also prevent drainage of water from the wetlands and reduce the input of nutrients to the wetlands carried by the river sediments. Such activity results into deterioration of marshes and ultimately loss of land to open water.

### *Oil and Gas Pipelines*

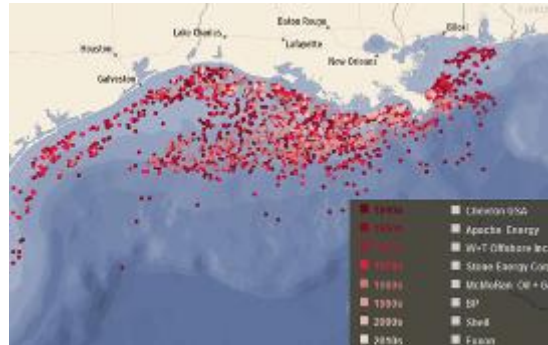
Current and historic exploration and production of marsh oil fields also cause damage to the sensitive coastal ecosystem. It should be noted (see Figure A.1) that many of the pipeline and canals were dug by oil companies years ago were never filled in. Recently, the East Bank Levee Board filed a lawsuit (July 24, 2013) against the ninety-seven oil, gas and pipeline companies with the aim to force the oil companies to pay for the damage they caused to the marshes<sup>6</sup>. Dredging of canals, for roughly 9300 miles of pipelines, to connect approximately 50,000 oil and gas production facilities (NRC 2004) has caused saltwater to intrude and further degrade the existing coastal marshes. With the impairment of the marsh vegetation, the soil holding capacity of the root is reduced allowing soil to erode due to tidal actions. Furthermore, extraction of hydrocarbons creates subsurface pressure in the oil fields, which contribute to the subsidence of the land area. Morton et al.'s study of historical subsidence and land loss in Louisiana (2005) strongly supports a link between hydrocarbon extraction and local coastal loss. Apart from the oil and gas infrastructure, the 2010 Deepwater Horizon Oil spill had significantly affected the coastal communities in Louisiana and other Gulf Coast states. According to National Academy of Sciences (2013), approximately 1,100 linear miles of coastal wetlands were affected by the spill. Fisheries, marine mammals and the deep-sea region of the Gulf of Mexico were severely affected. For instance, there was a 20 percent decrease in commercial fisheries. The spill also triggered a major concern about safety in consuming Gulf seafood. In addition, from February 2010 to December 2012, some 817 bottlenose dolphin deaths were documented compared with about 100 per year between 2002 and 2009 (NAS 2013). The oil spill also impacted the deep-sea and ecosystem service like pollution attenuation that happens through degrading microbe and

---

<sup>6</sup> Current status: June 6, 2014; Gov. **Bobby Jindal** signed into law [Senate Bill 469](#), which will kill the Southeast Louisiana Flood Protection Authority-East's (SLFPA-E) lawsuit against 97 oil, gas and pipeline companies for their role in coastal damage (Woodward 2014).

nutrient recycling. These services are very critical to marine biodiversity at all depths of the Gulf of Mexico.

**Figure A.1 Active Oil and Gas Production Platform in the Gulf of Mexico**



*Source: Bureau of Ocean Energy Management, Regulation and Enforcement*

### ***Sea Level Rise***

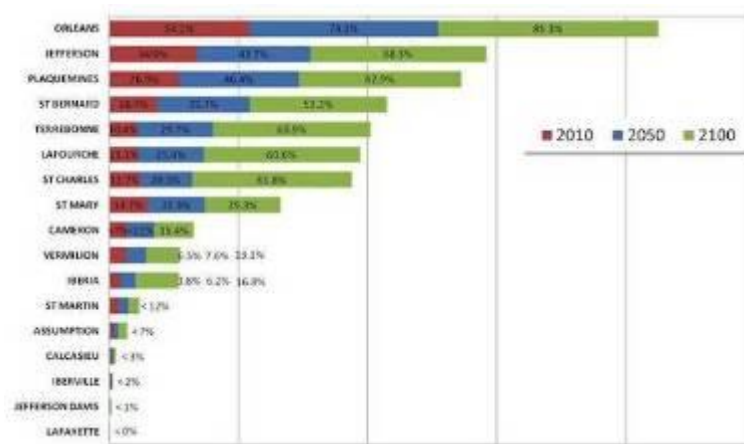
As the name indicates, sea level rise is a phenomenon of increase in sea level over an extended period. It is caused mainly by the thermal expansion of water, and the excessive melting of snow caps and glaciers. A small amount of sea level rise can correspond to significant shoreline changes in this low-lying and gradually sloping area. A significant impact of sea level rise has been coastal land loss through erosion and submergence of the coastal landscape. There is a consensus among the scientific community that sea level rise is a result of global warming (IPCC 2014, Khandekar 2009, Meehl et al. 2007). And there is much concern in the current technical literature (IPCC 2014, Houston and Dean 2011, Strauss 2013) about the possibility of accelerated sea level rise due to global warming. Although estimates of future sea level rise have varied widely, a consensus that is followed by the scientific community until the present day is that by 2100, the sea level globally will rise in the range of 1.6-6.0 feet (IPCC 2014, Houston and Dean 2011, Strauss 2013).

Sea level rise is a major force in shaping the Plaquemines Parish coastline. Studies of the geologic development of Mississippi delta plain indicate that with the decrease in supply of sediments from floodwater, the rate of subsidence outpaces the rate of sediment build up (Burkett, Zilkoski, and Hart 2003). The sediment supply in the area decreases mainly because of the construction of the artificial levees along the river. These levees direct the river and most of the sediment into the Gulf of Mexico. Plaquemines Parish, therefore, faces land loss that is caused by high rates of relative sea level rise (combination of subsidence and eustatic sea level rise), decreased supply of sediments, multiple storm events and change in the hydrologic regime

of the Mississippi River discussed in the previous section. In Figure A.2, the NOAA chart shows the percentage of land in coastal Louisiana parishes projected to be below sea level from 2010 to 2100. Estimates indicate that Plaquemines will have 46.4 percent (second highest after Orleans Parish) land below sea level from 2011-2050 and 62.9 percent land will be below sea level from 2051- 2100 (third highest after Orleans and Jefferson Parish), thereby signifying rapid acceleration of loss of coastal land below sea level.

It is interesting to note that although Orleans and Jefferson Parish have higher percentages of land below sea level, they have relatively fewer instances of flooding than Plaquemines Parish. In both the cases, the land is surrounded by the Greater New Orleans Levee System. Plaquemines Parish is cut in two halves lengthwise by the Mississippi River as it drains into the Gulf of Mexico, with much of the Parish area unprotected by a ‘back’ levee system<sup>7</sup>. Also, many construction projects intended to bolster protection in the Parish are not anywhere close to completion. As a result, Plaquemines parish is in higher imminent danger of land loss than Jefferson Parish and Orleans Parish.

**Figure A. 2 Projections of Percent Land below Sea Level by Coastal Parish**



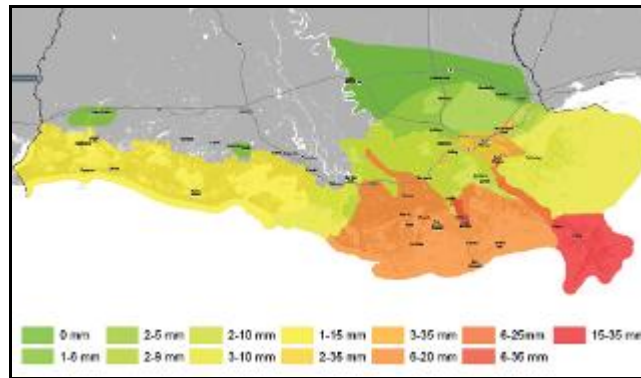
Source: NOAA

### *Land Subsidence*

<sup>7</sup> The Parish has two levees. The one that runs along the river and the one that runs along the edge of the land away from the river.

Land subsidence occurs when there is downward shifting of land in response to anthropogenic or geologic causes. The entire East Coast and the Gulf Coast of United States are naturally subsiding. However, the subsidence problem in Louisiana's vulnerable coastal lowland is acute. Plaquemines Parish –Comprehensive Master Plan (2013) state that, in the past 50 years Plaquemines Parish has lost 248 mi<sup>2</sup> of land due to sea level rise and land subsidence. Figure 3.6 illustrates the very high rate of subsidence in the active Mississippi delta (also known as Plaquemines-Balize Delta, marked red in the Figure 3.6 below: 15-35 mm), a subsidence rate over 3.5 feet per century. The centrally located portion of the Parish has a moderately high (0.02-0.08 feet per century or marked orange: 6-25mm) subsidence rate.

**Figure A. 3 Regional Range of the Subsidence Rate**



Source: Louisiana's Comprehensive Master Plan for a Sustainable Coast

According to the literature (Gagliano et al. 2003, Gagliano 2005), Plaquemines Parish experienced most of the subsidence near the mouth of the Mississippi River (Plaquemines-Balize Delta; 15-35 mm). The main causes of subsidence in this region are as follows:

- *Lower sediment loading is due to altered hydrology* It is believed by the physical scientists and geographers that the land formed by accumulation of river sediments naturally subsides over time. Geological history of Mississippi delta indicates that deposition and accretion by plant growth always outpaced the natural subsidence. However, river dredging, flood control structures and other anthropogenic activities have now altered the natural flow of the river, thereby impeding the sediment load naturally delivered by the river at the Plaquemines-Balize Delta. It causes the phenomena of subsidence to dominate and land area to sink below sea level.
- *Compaction of sediments* Sediment deposited by the river undergoes the compaction due to sediment loading over a period. As more sediment is loaded, there is a reduction in the

space between soil particles. Therefore, due to a reduction in porosity, soft sediment starts compacting. As the sediment compacts, subsidence occurs, and the land gradually sinks causing land loss. Scientists believe that Louisiana is on a tectonic system that extends below the Gulf of Mexico. The fault blocks beneath Louisiana's coastal zone is gradually tilting and sinking towards the Gulf of Mexico, as a result, the accumulated sediment pressure on the bedrock over a period causes fault-induced subsidence, leading to land loss.

- *Oil and Gas exploration* Subsidence also occurs due to removal of oil and gas from the ground. Most of the time ground water or other pressurizing substances are extracted during the fuel extraction process. It causes the clay rock to collapse causing permanent loss of elevation of the ground.

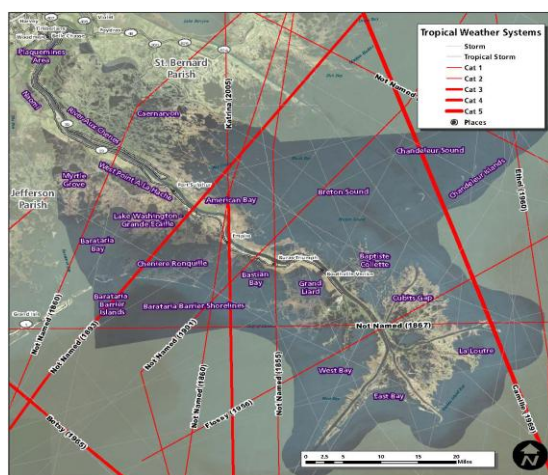
### ***Hurricane/ Storm Events***

On August 2005, Hurricane Katrina made landfall at Buras in Plaquemines Parish. Buras is a small town located within the Greater New Orleans Levee System with an elevation of 3 feet. Storm surge height of approximately 20 feet approached the southern coastline and gradually covered the town and Parish as it moved northward with a wind speed of 140 mi<sup>2</sup> per hour (mph) (NOAA 2005). Ninety-eight percent of the Parish residents evacuated and nearly 300,000 homes were lost and many were left dead (LAGIC 2006). The same year Hurricane Rita made landfall as a category three hurricane with a three-foot storm surge inflicting further damage to the existing weakened levee system protecting the Parish. Hurricane Gustav (2008) and Hurricane Ike (2008) caused severe flooding and further aggravated the existing issue of sea level rise, subsidence, depopulation and rise in the number of repetitive flood loss properties. Research indicates that Katrina, Rita, Gustav and Ike were not the only storms over the past few centuries.

Southeast Louisiana and especially Plaquemines Parish have historically faced destructive hurricanes. Since the Parish is a part of the southeastern Louisiana deltaic plain, it has repeatedly been pounded by hurricanes and storm events over the years. Figure A.4 is a map of historical Hurricane/ storm tract between the years 1956-2005. Table A-1 list all the major hurricanes that passed over Louisiana and some over Plaquemines Parish.



**Figure A. 4 Historical Hurricane/Storm track over Plaquemines Parish (1956-2005)**



Source: NOAA

**Table A- 1 Major Hurricanes in Louisiana**

Name	Year	Hurricane Category
Audrey	1957	4
Betsy	1965	4
Camille	1969	5
Carmen	1974	4
Andrew	1992	4
Ivan	2004	4
Katrina	2005	4
Rita	2005	3
Gustav	2008	2
Ike	2008	4
Isaac	2012	1

Source: NOAA

Immediately after Hurricane Katrina, The USGS land area change analysis indicated that the total water area increased by 217 mi<sup>2</sup> in coastal Louisiana and 19 mi<sup>2</sup> in the deltaic plain (of which Plaquemines is a part) as an effect of Hurricane Katrina alone. Therefore, due to its unique location and other associated natural causes discussed above, Plaquemines Parish faces greater likelihood of losing land from hurricane events than the other coastal parishes in Louisiana.

### *Invasive species*

Animal invasive species like nutria were found to be one of the major causes of marsh deterioration in southeast Louisiana (Jordan and Mouton 2010). Nutria is a large semi-aquatic rodent that is indigenous to Argentina. It was first released in the Louisiana wetlands by the state and federal agencies with the intention of providing a new source of fur harvest and to control the problem plants like water hyacinth and alligator weed. These species like to live in fresh, intermediate and brackish marsh and wetlands. Some of the harmful effects on Louisiana’s coastline due to nutria include:

- Nutria eats the roots and stems of plants. It is, therefore, known to destroy about ten times more vegetation than what they actually consume;
- Nutria can cause riparian areas into muddy bogs by destroying and jeopardizing marshes that provide protection for flooding and habitat for wetland biodiversity;
- Nutria builds burrows in the levees, dikes, and embankments that cause banks to erode and collapse;
- Nutria also serves as a host to a variety of parasites and pathogens that are equally harmful to the healthy marsh.

The coast wide Nutria Control Program was first funded by CWPPRA, with intent to restore wetlands and have sustained reduction in a nutria population. According to the program, annual aerial surveys assessing herbivory in Louisiana have documented approximately 26,273 acres of marsh converted to open water due to nutria vegetative damage (Jordan and Mouton 2010). Since Plaquemines Parish is 65.22 percent water and has a significant amount of wetlands coastline ripe for nutria consumption, it has potentially higher threats from this type of land loss than other coastal parishes.

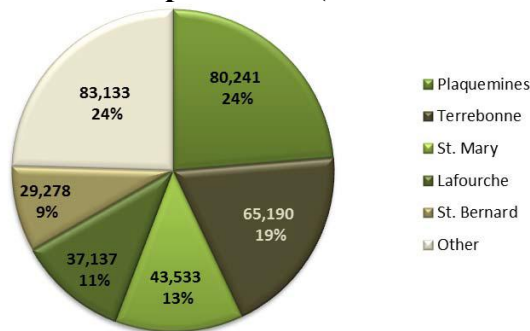
**Table A- 2 Land and Water Area**

<b>Parish</b>	<b>Land Area in miles<sup>2</sup></b>	<b>Water Area in miles<sup>2</sup></b>	<b>Total Area</b>	<b>% Land</b>	<b>% Water</b>
<b>Jefferson</b>	305.9	336.5	642.4	47.61	52.38
<b>Plaquemines</b>	844.6	1584	2428.6	34.77	65.22
<b>Terrebonne</b>	1255.1	825	2080.1	60.33	39.66
<b>Orleans</b>	180.6	169.7	350.3	51.55	48.44

*Source: US Census Bureau*

Additionally, nutria harvests were also studied in the coastal parishes, during the 2010-2011 seasons through the coastwise Nutria Control Program (Jordan and Mouton 2010). It was observed that Plaquemines Parish had the highest number of traps followed by Terrebonne and St. Mary parishes. It can be inferred that the large nutria harvest in Plaquemines Parish is an indicator of the significant amount of habitat, and the corresponding wetland loss as a result of these species. Figure A.5 indicates the parish distribution of nutria harvest in the year 2010-2011 according to the State of Louisiana Coastal Nutria Control Program.

**Figure A. 5 Nutria Harvest per Parish (2010-2011 Season)**



*Source: Coastwise Nutria Control Program, 2010-2011*

### **Impacts of Coastal Land Loss in Plaquemines Parish**

Studies state that the coastal land loss has global impacts encompassing flora, fauna, community and economy. The following sections discuss these areas in further detail.

#### ***Demographics***

It must be noted that the Plaquemines Parish is located in a dynamic natural setting, where approximately three percent of land is easily developable and 97 percent lies in the floodplain, which is more vulnerable to land loss and hazard risk (Plaquemines Parish 2013). While much development in the Parish is happening within the federal levee system, loss of more land may result in more depopulation of the Plaquemines Parish as current protection systems are not designed to function properly without significant wetland buffers. Given these realities it is important to understand the demographic shift of coastal Louisiana parishes. Below is a comparative study of the population trend of Jefferson, Orleans, Plaquemines and Terrebonne Parish, after recent Hurricanes such as Katrina, Rita and Gustav.

Based on data retrieved from US Census Bureau (Table A.3) there was a decline in population between the years 2000 and 2010 that led to 11.3 percent drop in the cumulative

residential population for the New Orleans MSA<sup>8</sup>. (US Census Bureau American Community Survey (ACS) Annual estimate 2000, 2005 and 2010). Plaquemines Parish faced -20.28 percent population change post-Hurricane Katrina compared to Orleans (-23.96 percent) and Jefferson (-4.10 percent). It must be noted that Plaquemines Parish was showing positive growth in population before 2005, but saw a drastic drop (-20.28 percent) thereafter. Also, Plaquemines Parish culture is an integral part of Louisiana’s folklore and heritage. With depopulation and land loss, it is feared that the unique culture of southeast Louisiana may be lost forever.

**Table A- 3 Trends in Population Pre and Post Katrina in the Coastal Parishes**

<b>Parishes</b>	<b>2000</b> (Baseline)	<b>2005</b>	<b>2010</b>	<b>% Change Pre- Katrina</b>	<b>% Change Post- Katrina</b>
<b>Orleans</b>	484,674	452,170	343,829	-6.71	-23.96
<b>Plaquemines</b>	26,757	28,903	23,042	8.02	-20.28
<b>Terrebonne</b>	104,503	107,094	111,860	2.48	4.45
<b>Jefferson</b>	455,466	451,049	432,552	-0.97	-4.10

### *Affordable Housing*

South Louisiana, and especially Plaquemines Parish, has a unique topography that makes it vulnerable to flooding. Nearness to the Gulf, low ground level elevation, a high percentage of water area and lack of areas for rainwater runoff are major reasons for repetitive flooding in the Parish. Land loss and increase in the water area exacerbates the issue of flooding in Plaquemines and puts local communities in the highest level of flood risk. The wetlands or coastal vegetative lands act as a barrier and provides critical protection against incoming hurricane storm surges (Plaquemines Parish 2013). Losing land in the form of coastal wetlands dramatically increases the risk from hurricanes, storm surge and consequent flooding.

Despite efforts of NFIP, flood mitigation projects, and increased education about flood loss, flood damages remain high in this area. As a response, NFIP determines the property owner’s premium via a risk assessment based on the property’s location on the flood insurance rate map, and the amount of coverage the property owner desires. In other words, it is a means for property owners to protect themselves during such events. NFIP also continually faces challenges with the task of making funds available for claims while trying to keep the price of flood insurance at an affordable level for the community. The Flood Insurance Reform Act of 2004 amended NFIP with an objective of reducing payouts to Repetitive and Severe Repetitive

<sup>8</sup> New Orleans MSA includes New Orleans–Metairie–Kenner (Jefferson, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, and St. Tammany parishes)

Flood Loss (RL & SRL)<sup>9</sup> properties. These properties have cost FEMA 12 billion since the inception of the NFIP with LA accounting for \$3 billion or approximately a quarter of all the claims nationwide since 1978. Although St. Bernard, Lafourche, St. John and other coastal parishes account for the total \$3 billion insurance claim, I only provide data for Orleans, Jefferson, Terrebonne and Plaquemines parishes due to time constraint and restricted access to the data set. Based on the data obtained related to Repetitive and Severe Repetitive Flood Loss claim numbers (pre- and post-Hurricane Katrina) of Plaquemines and other neighboring coastal parishes, the following are some observations (Table A-4):

- The total number of properties making a claim increased in all the four parishes during 2005-2008 due to major hurricane events (Katrina, Rita, Gustav and Ike);
- There was a sharp decrease in the number of claims and total loss during 2009-2012 in all parishes except for Plaquemines Parish. The decrease in claims in other parishes is probably due to the success of flood mitigation efforts which were put in place after 2005 hurricane events and also lack of a major storm/flooding events since Katrina;
- Plaquemines Parish showed a 35 percent increase in total loss from 2005-2008 to 2009-2012 primarily because a substantial portion of its current properties are still beyond the flood protection system. It should be noted that, in the same periods, the total loss claims decreased for all other (studied below) coastal parishes in Louisiana.

**Table A- 4 Repetitive Flood Loss Analysis**

Coastal Parish	2001- 2004			2005-2008			2009-2012		
	# Properties	Total Claims	Total Loss (\$, Million)*	# Properties	Total Claims	Total Loss (\$, Million)*	# Properties	Total Claims	Total Loss (\$, Million)*
<b>Orleans</b>	4650	18374	726	4832	18500	788	624	2426	102
<b>Jefferson</b>	3961	15802	445	7574	26150	616	890	3201	97
<b>Terrebonne</b>	954	3131	103	1915	4017	158	132	466	22
<b>Plaquemines</b>	126	414	15	321	815	22	218	531	63

\*Note: Dollar amount approximate to the nearest decimal

<sup>9</sup> Repetitive Flood loss properties are defined as NFIP insured property where 2 or more claim payments of more than \$1000 have been paid within any rolling 10 year period since 1978. Severe Repetitive Loss can be defined as multi-family residence that has had 4+ claims of more than \$5000 or at least 2 claims that cumulatively exceed the reported building's value.

### *How is it Affecting Community Housing?*

Changes to flood insurance policies as a result of the Biggert-Waters Flood Insurance Reform Act (2012) not only affected people outside the levee but also many structures inside the levee protection, whose owners until now had received subsidized flood insurance. The national government believes that changes will bring the program out of debt and provide actuarial soundness. However, critics argue that changes brought by Biggert-Waters will disproportionately affect policyholders located in high-risk areas and have the potential to render those properties valueless. Louisiana, being the third largest policyholders in the country, has a total of 473,160 flood insurance policies under the NFIP (FEMA 2014). There are approximately 238,000 policies in Louisiana that will be impacted by this legislation. In other words, 49 percent of the policyholders in Louisiana will be losing their subsidy and witness dramatic increase in insurance rate.

According to the claim numbers in Table A-4, the Gulf Coast parishes have a high chance of getting impacted with this policy change. The elimination of subsidies according to the Act will increase the premium of the home. In Plaquemines Parish, for example, there are approximately 5,000 buildings in that are outside the 100-year flood protection. These 5,000 building were built at or above the NFIP requirement when they were constructed. Without grandfathering<sup>10</sup>, these properties/homes will become significantly more expensive to insure and potentially very difficult to sell. Therefore, the overall goal for Plaquemines Parish will be to get FEMA to consider goals and objectives of state of Louisiana Comprehensive Master Plan (CPRA 2012) and on going levee improvements for which several millions of dollars have been already allocated. With this change in policy and coastal land loss, required flood insurance policies and housing may be outright unaffordable, and people will be forced to move out of their homes leading to further depopulation of these coastal parishes.

### *Coastal Resources*

The economy of Plaquemines Parish largely concentrates on the oil & gas, citrus/produce farming and transportation sector. Land loss has had an impact on the availability of natural coastal resources and related ecosystem services. Below is a list of major coastal resources and ecosystem services provided by the Plaquemines Parish. It is then followed by a discussion of how coastal land loss impacts these resources:

- Fresh and estuarine water for commercial and recreational fishing purpose (mainly Oysters, shrimp, crabs, finfish, etc.);

---

<sup>10</sup> The Program (NFIP) provides a lower-cost flood insurance rating option known as “grandfathering,” which is available for property owners who: 1) Have flood insurance policies in effect when the new flood maps become effective; or 2) Have built in compliance with the FIRM in effect at the time of construction

- Unique and endangered wetland habitat;
- Agricultural produce (Citrus farming);
- Marshes, water bodies and habitat for hunting and trapping.

### *Seafood and Fisheries*

The Parish is home to the leading commercial fishing fleet in the lower 48 states and accounts for 70 percent of Louisiana's seafood industry's total commercial landings (shrimp, oysters, crab, and fish) (Plaquemines Parish 2013). The Parish is also known as Sportsman's Paradise because of the best commercial and sports fishing that it provides.

It is projected that there would be 50,000 jobs lost in the fish harvesting, wholesale and processing industry due to a 30 percent decline in the commercial and recreational fish catch by 2040 if Louisiana continues to lose land at the present rate (Davis-Wheeler 2013). Part of commercial fishing is also oyster industry. It was significantly impacted in the early 1960s due to elevated salinity level in the marsh water and loss of the oyster breeding area. Additionally the 2010 deepwater horizon oil spill is estimated to cause short-term revenue loss to the fishing industry according to a report by GNO.Inc. The report focused on the impact of the oil spill on the availability of marine species like crabs, oysters and shrimps that together accounted for \$273 million of Louisiana's seafood in revenue in the year 2008. The report projected a \$115 million to \$172 million loss in gross revenue from 2011 to 2013 for commercial fisheries due to the spill based on the impact to just crabs, oysters and shrimps (GNO Inc. 2010).

### *Unique and Endangered Wetland Habitat*

Land loss also impacts the valuable wildlife habitat. The Parish is home to 352 species of birds (Johnston 2014) and six nesting islands (Hahn 2013). Some bird's species are natives of Louisiana, and some of them stop in this nesting ground during migration. Bird watching is one of the chief recreational activities in the Parish. Cat Islands in Plaquemines Parish are a prime example of once thriving habitat that provided sanctuary and a nesting place for brown pelicans and green sea turtles. According to the article (Hahn 2013) in 1935 Cat Island was a 350-acre area, it was reduced to 30 acres by 1998. Recent data note that it currently encompasses less than 1 acre and has lost the major portion of migrating birds due to loss of the nesting ground.

### *Citrus Farming*

Plaquemines Parish accounts for 60 percent of the citrus grown in Louisiana. The coastal zone is the primary area for commercial citrus production as all types of citrus can be grown in this area. Among 17 different types of citrus farmed in Plaquemines Parish, Satsuma and navel oranges represent 90 percent of the total citrus crop.

Wetland loss due to cutting of canals, which are perpendicular to the coast, creates new open water areas by drowning wetlands and allowing saltwater intrusion into the groundwater. It causes salinity problems for the citrus farms and trees in the Plaquemines Parish. High content of salt water in the trees ultimately leads to decreased flowering and fruit yield.

### *Fur Trapping*

Forty percent of Louisiana's wild harvest comes from the wetlands that shelter nutria, muskrat, mink, raccoon, otter, bobcat, beaver, coyote and opossum statewide. According to Coreil's (1994) study of fur yields, this number has been constantly decreasing over time. The main reason behind the decline is an increase in salinity level of the marshes that results in the disappearance of vegetation. The barren marshes reduce suitable habitat and ultimately reduce resources available to the fur industry in both Plaquemines and St. Bernard Parish (Evans-Graves Engineers 2013)

## **Potential Indirect Economic Impact**

### *Oil and Gas Industry*

Apart from a thriving citrus industry, the Parish has extensive oil and gas facilities and infrastructure that is vital to the nation's energy needs. The Parish currently produces 17 million barrels of oil and 105 million cubic ft. of gas annually. It accounts for approximately 25 percent of the annual state severance revenues (\$100 million) and annual royalty revenues (\$140 million) (Plaquemines Parish 2013). The Parish has 11,000 state oil and gas wells and 750 miles of onshore pipelines. Additionally it has 247,000 barrels of daily crude refining capacity and 1.3 billion cubic ft. of daily natural gas processing capacity therefore, it contributes \$2.1 billion in mineral revenue and employ 1,800 people in oil and gas industry accounting for a total of \$80 million in annual wage.

With the rapid loss of wetlands, the pipelines that are buried under the marshes are vulnerable to destructive Gulf storms and other accidents. The existing oil and gas facilities and infrastructure often face long down times due to seasonal storm/hurricane events. The loss of such critical infrastructure severely impacts the nation's oil and gas production and supply. Such impacts are exacerbated by the disappearance of barriers islands and wetlands. This theory was tested to be true when oil refineries were forced to shut down due to damages caused by Hurricane Katrina. Oil prices across the nation shot up almost instantaneously.

### *Ports and Significant Infrastructure*

The Plaquemines Port, Harbor and Terminal District is the 8th largest in the United States. The Parish is the point of entry/exit for 500 million tons of cargo annually transported on the Mississippi River. The port transports bulk agricultural commodities, concrete and steel to



the American market through these facilities. Wetland loss may jeopardize crucial port facilities that handle most cargo tonnage for the middle of the country. Existing transportation infrastructure will also suffer as highways and rail system that crisscross the Louisiana marshes are inundated and the cost of channel and river maintenance increases. The treatment costs of drinking water will also increase causing the taxpayers to incur an additional fee.

The Naval Air Station/Joint Reserve Base (NAS-JRB) in Belle Chasse currently maintained a civilian and military staff of 7,100 with expected employment to have increased to 9,550 by 2011 (Parish Master Plan 2013). This facility contributes over \$600 million annually to the local economy. Relocation of the military base due repeated storm events and land loss would lead to significant unemployment and loss of revenue for the Parish.

Plaquemines is also home to the two largest coal terminals in the United States: United Bulk Terminal and International Marine Terminals. Shutdown of these terminals, due to land loss, may also cause a potential loss of revenue for the local economy. As the scope of loss mentioned above has national impact, the entire nation has a stake in protection and restoration of Plaquemines' coastal land.

## Appendix B

### **University Committee for the Protection of Human Subjects in Research University of New Orleans**

---

*Campus Correspondence*

Principal Investigator: David Gladstone  
Co-Investigator: Nadini Seth  
Date: February 7, 2014  
Protocol Title: "Land Loss in Plaquemines Parish: A Policy Study"  
IRB#: 02Jan14

The IRB has deemed that the research and procedures described in this protocol application are exempt from federal regulations under 45 CFR 46.101 category 2, due to the fact that any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation. In addition, your request for a waiver of consent documentation has also been approved.

Exempt protocols do not have an expiration date; however, if there are any changes made to this protocol that may cause it to be no longer exempt from CFR 46, the IRB requires another standard application from the investigator(s) which should provide the same information that is in this application with changes that may have changed the exempt status.

If an adverse, unforeseen event occurs (e.g., physical, social, or emotional harm), you are required to inform the IRB as soon as possible after the event.

Best wishes on your project.  
Sincerely,



Robert D. Laird, Ph.D., Chair  
UNO Committee for the Protection of Human Subjects in Research

## Vita

Nandini Seth was born in the steel city of, India, Durgapur. She obtained her Bachelors and Masters Degree in English Literature from The Maharaja Sayajirao University of Baroda in 2009. She joined the University of New Orleans graduate program to pursue a Masters of Urban and Regional Planning and worked as a Graduate Research Assistant for the UNO Center for Hazards Assessment, Response and Technology. She received her second Master's degree in Urban and Regional Planning in 2014.