Research Strategy

RESTORE Act Center of Excellence for Louisiana

October 26, 2016

ABOUT THE RESTORE ACT CENTER OF EXCELLENCE FOR LOUISIANA

The mission of the RESTORE Act Center of Excellence for Louisiana (Center) is to provide research directly relevant to implementation of Louisiana's Coastal Master Plan by administering a competitive grants program and providing the appropriate coordination and oversight support to ensure that success metrics are tracked and achieved. The Center is a separate program within The Water Institute of the Gulf, which is a not-for-profit, independent research institute dedicated to advancing the understanding of coastal, deltaic, river and water resource systems, both within the Gulf Coast and around the world. For more information about the RESTORE Act Center of Excellence for Louisiana, visit LA-COE.org.

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Preface

This document is a core component of the RESTORE Act Center of Excellence for Louisiana (Center). It guides the competitive research that the Center supports and is focused on issues pertinent to coastal Louisiana with emphasis on advancing Louisiana's Coastal Master Plan. This document identifies key topical near-term (< 2 years) and mid-term (2–5 years) research needs, including articulation of the scientific and technical problems underlying these needs, potential outcomes, and multi-disciplinary opportunities. The Research Strategy will be revised during the second year of Center operations (November 1, 2016–October 31, 2017) to include long-term (> 5 years) research needs.

This document identifies near-term and mid-term research needed to support the implementation of the Coastal Master Plan, regardless of the source of funds. Thus, as well as providing clear guidance on the use of Center research funds, this document is also useful for other programs that seek to support research that furthers sustainable and resilient natural and human communities in coastal Louisiana.

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Executive Summary

The Water Institute of the Gulf was designated by the Coastal Protection and Restoration Authority (CPRA) as the RESTORE Act Center of Excellence (Center) on April 8, 2014. This followed submission of a proposal that introduced a phased approach to systematically (1) develop and implement the Center of Excellence program, (2) administer a competitive grants program that rewards the best and most relevant research proposals, and (3) provide the appropriate coordination and oversight to ensure success metrics are tracked and achieved. The proposal was developed in collaboration with academic partners in Louisiana.

The mission of the Center is to support research directly relevant to implementation of Louisiana's Coastal Master Plan. Developed by CPRA with input from citizens, legislators, parish representatives and stakeholder groups and using the best available science and engineering, the Coastal Master Plan focuses state efforts and guides actions needed to sustain Louisiana's coastal ecosystems, safeguard coastal populations, and protect vital economic and cultural resources.

As a guiding document for the competitive research that the Center supports, the Research Strategy focuses on issues pertinent to coastal Louisiana with emphasis on advancing Louisiana's Coastal Master Plan. Near-term (< 2 years) and mid-term (2–5 years) research needs were identified in coordination with CPRA, a Technical Working Group comprised of researchers from Louisiana academic institutions, Research Strategy Contributing Experts, a Coastal Research Priorities Town Hall meeting held in conjunction with Louisiana Sea Grant, and the public.

The Research Strategy outlines research, modeling and monitoring needs for informing Louisiana's Coastal Master Plan. Information is presented on near-term and mid-term research needs including articulation of the scientific and technical problems underlying these needs, potential outcomes, and cross-disciplinary opportunities.

Research needs were categorized into eight topical areas:

1. Riverine hydrology, including geomorphology and sediment dynamics
2. Coastal and estuarine ecology, including fisheries wildlife, vegetation and nutrient dynamics
3. Geotechnical and structural engineering
4. Deltaic geology, including delta building and subsidence
5. Coastal and estuarine hydrology, geomorphology and sediment dynamics, including coastal wetland soil dynamics and barrier beach and shoreline processes
6. Physical climatic processes, including climate change and tropical cyclone surge and wave dynamics
7. Socioeconomics, including environmental sociology, rural and urban planning, cultural anthropology, hazards geography, risk assessment, community resilience, and coastal industrial and resource economics
8. Regulatory policy issues

In its entirety, this document provides guidance on the use of Center research funds and identifies critical research needs to further sustainable and resilient natural and human communities in coastal Louisiana by supporting implementation of Louisiana's Coastal Master Plan.

Introduction

On July 6, 2012, President Barack Obama signed into effect the RESTORE (Resources and Ecosystem Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States) Act. The Act established the Gulf Coast Restoration Trust Fund in the U.S. Department of Treasury and directed 80% of the civil penalties paid after July 6, 2012, under the Federal Water Pollution Control Act in connection with the Deepwater Horizon oil spill, to be deposited into the Trust Fund and invested. As part of this Act, 2.5 percent of funds will be dedicated to the establishment of Centers of Excellence in each of the five Gulf Coast States, with each State receiving approximately $26 million over 15 years.

On January 6, 2014, The Water Institute of the Gulf, in collaboration with academic partners from Louisiana, submitted a proposal to CPRA that introduced a phased approach to systematically (1) develop and implement the Center of Excellence program, (2) administer a competitive grants program that rewards the best and most relevant research proposals, and (3) provide the appropriate coordination and oversight to ensure success metrics are tracked and achieved. On April 8, 2014, CPRA announced the Institute as the RESTORE Act Center of Excellence for Louisiana (Center).

In accordance with the federal regulations that will preside over funds administered as part of the RESTORE Act, CPRA submitted a grant application to the U.S. Department of the Treasury in July 2015 to apply for available funds for this program. On October 19, 2015, the Treasury approved the grant application.

Following a mandate by the U.S. Department of Treasury requiring that Centers of Excellence must focus efforts on a selected set of disciplines, the Center focuses on the following:

- Coastal and deltaic sustainability, restoration and protection, including solutions and technology that allow citizens to live in a safe and sustainable manner in a coastal delta in the Gulf Coast Region
- Coastal fisheries and wildlife ecosystem research and monitoring in the Gulf Coast Region
- Sustainable and resilient growth, economic and commercial development in the Gulf Coast Region
- Comprehensive observation, monitoring, and mapping of the Gulf of Mexico

Working within these disciplines, the mission of the Center is to support research directly relevant to implementation of Louisiana's Coastal Master Plan. The Coastal Master Plan, which was developed by CPRA with input from citizens, legislators, parish representatives and stakeholder groups using the best available science and engineering, focuses state efforts and guides actions needed to sustain Louisiana's coastal ecosystems, safeguard coastal populations, and protect vital economic and cultural resources. The Coastal Master Plan is updated every 5 years, providing an opportunity for new knowledge and understanding to be incorporated. In addition, on-going project implementation, operation and maintenance utilize the most up to date thinking about system dynamics and project interactions within the complex natural and human landscape. Thus, many opportunities exist for research to support project implementation, and the Center is one vehicle through which research is targeted towards supporting implementation of the Coastal Master Plan.

Research needs were identified in coordination with CPRA, a Technical Working Group comprised of researchers from Louisiana academic institutions, Research Strategy Contributing Experts, a Coastal Research Priorities Town Hall meeting held in conjunction with Louisiana Sea Grant, and the public. This Strategy focuses on near-term (< 2 years) and mid-term (2–5 years) research needs grouped by topical area. For each topic, the scientific and technical problems underlying these needs are outlined, research needs are identified, including some that address multiple topical areas, and some potential outcomes (e.g. measurable impacts or results) are briefly summarized.

Neither the topical areas nor the research needs listed under each topical area are prioritized; grouping by topical area is for organizational purposes only. The Center and those who supported the development of the research needs recognize that some of the most relevant research on coastal sustainability issues is cross-disciplinary in nature. Thus, the needs identified here should not only be considered as individual needs; rather, researchers can use these needs to develop research proposals that are focused on informing Louisiana's Coastal Master Plan by addressing one or more of the areas identified. Some cross-referencing by topic area is provided to indicate overlap or linkage among research needs in different topical areas. These are illustrative only and researchers will undoubtedly identify other areas of overlap and synergy as they prepare proposals. Similarly, many research needs listed here include a number of concepts that can be addressed individually or collectively. Their listing together within a research need does not necessarily imply that a single research project needs to address every aspect of the issues identified. Concepts are grouped for efficiency of presentation and to aid researchers with identifying the many aspects of some issues relevant to the Coastal Master Plan.

Topic 1: Riverine hydrology, including geomorphology and sediment dynamics

RATIONALE

The Coastal Master Plan recognizes that the use of riverine resources, including freshwater and sediments, is crucial to achieve a sustainable coastal ecosystem. While knowledge of riverine resources has increased markedly in recent years, details surrounding specific ways of using rivers, including the Mississippi River, through sediment diversions, require additional research. The long-term future of rivers as resources, as impacted by climate change, needs exploration to support Coastal Master Plan implementation.

RESEARCH NEEDS

- Investigate impacts of relative sea level rise on riverine hydraulics and sediment transport and deposition (Also see Topic 6)
- Improve understanding of cycling of sediments between estuarine and shelf systems, and forecasting models of sediment supply from the State's rivers to the coastal zone
- Identify and evaluate innovative/engineering methods of sediment capture and transport from river to bay/wetland systems, including improved understanding of sediment capture by existing man-made diversions and flooding control structures (Also see Topic 3)
- Develop improved parameters and coefficients for influence of vegetation on flow velocities and sediment transport for river diversions (Also see Topic 2)

OUTCOMES

Outcomes may include: improved understanding of riverine hydraulics and resulting boundary conditions into sediment diversions and future hydrographs of river flow; improved understanding of sediment dynamics, including spatial and temporal sediment availability and composition, and methods for determining sediment capture; and improved understanding and models of sediment fluxes to the lower rivers (including the Mississippi River) to inform long-term modeling and predictions of sediment diversions and marsh creation land building potential

Topic 2: Coastal and estuarine ecology, including fisheries, wildlife, vegetation and nutrient dynamics

RATIONALE

Sustaining coastal habitats to support recreational and commercial activities and for storm protection are objectives of the Coastal Master Plan. While broad-scale planning tools have been recently improved, interactions among species and their response to changing coastal conditions is still somewhat uncertain. Research is needed on primary producers and the factors that influence them, the wetland soils that underlie the basic land-water structure of much of the coast, and the trophic interactions and other environmental factors that influence restoration outcomes for fish and wildlife.

RESEARCH NEEDS

Nutrients, Vegetation and Soil

- Improve understanding of effects of water quality, anthropogenic and restoration activities, and natural processes on coastal primary producers, including: individual responses and linkages between emergent marsh, submerged aquatic vegetation, coastal forests and woody plant communities, phytoplankton and benthic microalgae, and linkages between emergent and submerged communities

- Develop nutrient-vegetation empirical relationships to identify controlling biogeochemical processes and plant species response for use in models

- Improve understanding of the feedbacks between plant dynamics and the environment on nutrient retention, cycling and export from coastal ecosystems, including relative distribution of different ecosystem types and sub-habitats

- Improve quantification of nutrient budgets, and models that represent them both within and across different ecosystems and along salinity gradients, by tracking transformation and assimilation pathways for nutrients within receiving basins, including water, plant, and upper trophic levels, under a range of potential flow conditions and restoration scenarios

- Compare existing methodologies for in-situ characterization of the shear strength of coastal marsh soils, evaluate preferred instrumentation and/or methodology across habitat types, and assess relationships between shear strength and belowground biomass

- Improve predictions of emergent marsh vertical accretion (both mineral and organic), soil strength, elevation change and plant diversity under restoration and non-restoration scenarios for all marsh types, including in situ production and retention of organic material and elevation feedbacks

Fisheries and Wildlife

- Investigate the effects of altered hydrologic conditions on food webs, including carbon and nutrient flow through the food web, effects on important prey assemblages (i.e. epifaunal and infaunal invertebrates and planktonic organisms that are prey for estuarine nekton), and how altered trophic dynamics may influence productivity of fishery species and upper trophic levels (including important wildlife species) (Also see Topic 5)

- Improve modeling capabilities, including predictions of diversions and other restoration influence, on wildlife populations and fisheries

- Investigate the impacts of restoration activities on the availability and quality of avian habitats and identify locations where avian habitats can be improved with woody plantings

- Improve understanding of the natural histories of coastal and estuarine species of concern, potential effects of restoration projects on reproduction, recruitment and populations dynamics of these species, and investigate effects of habitat changes, climate fluctuations and restoration activities on movement, migration and estuarine connectivity for animals utilizing coastal habitats, including movement of fishery species such as larger estuarine nekton (red drum, spotted sea trout, dolphins, etc.) (Also see Topic 6)

- Investigate methods to expedite oyster spat colonization and maintain sustainability of natural and bioengineered reefs

OUTCOMES

Outcomes may include: simulations of plant responses to the effects of nutrient loading rates; identification of how salt marsh planting success and restoration project sustainability can be enhanced; an understanding of how restoration actions affect life history dynamics for wildlife and fisheries; a set of biomarkers in a range of organisms to be used in monitoring assays; framework to guide restoration efforts that will ensure a sustainable estuary; and development of soil amendment techniques to enhance coastal restoration success

Topic 3: Geotechnical and Structural Engineering

RATIONALE

Understanding the behavior of the materials used to construct coastal protection and restoration projects is essential to predicting their performance under different environmental conditions, and planning of operations and maintenance activities. In addition, projects often involve the placement of engineered structures within natural environments where understanding the interaction between the structure and the surrounding environment is crucial to successful implementation.

RESEARCH NEEDS

- Investigate interdependence between hard infrastructure (i.e. levees, breakwaters) and nature-based infrastructure (living, vegetated shorelines) and reduce uncertainty for project engineering and design, implementation and sustainability of both hard and nature-based infrastructure, and develop robust methodology for design, implementation and monitoring (Also see Topic 2)

- Conduct combined geotechnical and morphodynamic studies to understand the protective role of intertidal coastal marsh vegetation on levees, and its capacity to resist erosion (Also see Topic 2)

- Assess impact of levee mass on structural integrity, compaction, physical stability and maintenance requirements

- Develop improvements for effective ground-based and/or remote techniques for levee monitoring

- Develop standardized geotechnical laboratory testing procedures beyond existing capabilities for hydraulically-dredged slurry for marsh creation/restoration projects

- Assess the resilience of engineered flood defense systems under hurricane-induced waves and currents and develop innovative methods for protecting coastal infrastructure, including flood defense systems, from impacts such as wave-induced erosion (Also see Topics 2, 5 and 6)

- Conduct laboratory evaluation and computational assessments using emerging innovative non-rock shoreline protection technologies such as suppression and sediment collection system, pile supported wave screen system, wave attenuation devices, buoyancy compensated erosion control modular system, and geotextile tubes to inform potential for adoption in practice

- Investigate technology for foundation soil improvement, and develop guidelines for structure designs by considering soil-structure-current (wave) interactions in restoration and protection projects including braced flood protection structures (i.e. vertical walls)

- Evaluate effects of restoration actions, such as diversions, on soil deformation under sediment loading

- Determine calibration factors for pile-soil interactions in very soft and soft soil conditions to enhance design of braced flood walls

- Assess the performance of lightweight aggregate subjected to long-term seawater exposure as deployed for coastal restoration

OUTCOMES

Outcomes may include: helping decision makers select the best technology for specific coastal applications to accumulate sediments and create new land; a clear understanding of the marsh soil and vegetation interactions and their combined reinforcing ability against marsh erosion; information to support development of efficient and cost-effective foundation-improvement methods; new methods for detection and mitigation that also involve structural engineering considerations as well as novel sensing solutions; and a set of local calibration factors for very soft to soft soil conditions that can be used with greater confidence to predict the performance of braced floodwalls under hurricane storm surges, improved design procedures for floodwalls

Topic 4: Deltaic geology, including delta building and subsidence

RATIONALE

Implementing the array of protection and restoration projects identified in the Coastal Master Plan in the context of the delta-chenier geologic system presents specific challenges. Few other major protection and restoration programs provide a precedent from which to learn. Integrating the longer-term geologic dynamics with the need for action to address near-term and mid-term needs presents a challenge for project planners and engineers. Targeted research in this area can help reduce uncertainty and/or quantify appropriate bounds of geologic dynamics for project implementation.

RESEARCH NEEDS

- Evaluate, qualitatively and quantitatively, temporal patterns of subsidence, geological stability and natural- and human-induced compaction, including direct measurements of subsidence on barrier islands/headlands and deep subsidence associated with fluid extraction, faulting, sediment loading and glacial isostatic adjustment (Also see Topic 3)

- Improve identification of faults and other geological features (e.g. slump blocks), including location, direction and magnitude of movement, and estimations of geological stability

- Enhance and extend capabilities in coastal morphodynamic modeling for extrapolating short-term field measurements to decadal predictions of coastal change

- Investigate novel methods to enhance sediment retention and maximize the process of land building

- Improve predictions of coastal processes (e.g. interior ponding, subsidence, sand shoreline dynamics, and shore edge erosion of the marsh platform) under normal and storm conditions (Also see Topic 2)

- Compare model predictions of deltaic development (e.g. lobe and splay development) with existing data and knowledge to reduce uncertainty in predictions of delta and crevasse splay growth and decay

OUTCOMES

Outcomes may include: information on spatial patterns of subsidence, deep subsidence and compaction rates throughout coastal Louisiana; better constraints on the coupling between subsidence and shoreline/marsh erosion; predictions of wetland creation rates as a function of location/environmental setting, such as grain size, presence/absence of vegetation and microbiota

Topic 5: Coastal and estuarine hydrology, geomorphology and sediment dynamics, including coastal wetland soil dynamics and barrier beach and shoreline processes

RATIONALE

The barrier shorelines and wetlands of coastal Louisiana are the foundation on which the productive ecosystem is based. Research in this area has been built upon in the development of the Coastal Master Plan. Understanding the nature of the sedimentary resources available and implications of their use for Coastal Master Plan implementation presents an ongoing challenge for researchers. In addition, focusing on the details of wetland loss processes from a geomorphic perspective, as well as larger-scale coastal dynamics, can provide important insight for both project planning and implementation.

RESEARCH NEEDS

- Investigate potential effects of restoration activities on Louisiana estuarine, beach, shoreface and continental shelf ecosystems
- Analyze the use of hard structures (seawall, breakwaters, terminal groins, etc.) as barrier island/shoreline protection measures (Also see Topic 3)
- Investigate and monitor created marsh platform settlement, compaction, consolidation, erosion, and induced subsidence, and assess relationships to marsh hydrology, salinity and soil saturation (Also see Topics 3 and 4)
- Utilize a systems approach to investigate the relationship and interdependence and transitions among internal marshes/wetlands, back bays, passes/inlets, barrier island-geomorphology, and tidal prism for incorporation into models
- Investigate surface and subsurface coastal flow regimes from the coast to inland areas, and from the river to the coast to improve predictions of fresh/salt balance across the coast
- Investigate the interaction between hydrologic and coastal hydraulic processes (Also see Topic 6)
- Investigate optimal use of sediment resources (including sediment from maintenance dredging and confined disposal facilities) for marsh platform creation, barrier island restoration, and other restoration projects (Also see Topic 4)
- Investigate the impact of relative sea level rise on various sediment deposits (nearshore and offshore) (Also see Topic 6)
- Improve models to reflect the spatial variation in sediment accumulation deposited by hurricanes/storms of different categories/strengths
- Investigate factors affecting barrier island restoration success (Also see Topics 2 and 3)
- Develop and apply efficient techniques to collect high fidelity elevation data throughout coastal marshes to enable ground-truthing of LiDAR data (Also see Topics 1, 2, 4 and 6)

OUTCOMES

Outcomes may include: quantitative and semi-quantitative relationships to assess barrier island/shoreline response to scenarios of restoration volume, or determination of sand deficits; quantified effect of backbarrier marsh loss; simulation tools for shoreline evolution along inlet-barrier systems; spatial distribution of marsh erosion/accretion/compaction patterns; quantitative and semi-quantitative relationships that can be used in modeling wetland evolution; a better understanding of instantaneous fluxes of sediment at marsh lateral boundaries; better modeling tools to simulate future sedimentation potential; analysis of the economic and ecological tradeoffs associated with rock shoreline protection measures for coastal Louisiana; high-resolution maps of land area change and better metrics/statistics for coastline change; forecasting tools that establish the relative contribution of mechanisms that drive coastal change

Topic 6: Physical climatic processes, including climate change and tropical cyclone surge and wave dynamics

RATIONALE

The Coastal Master Plan recognizes the importance of both future climate change and episodic forcing, such as storms and droughts, in shaping the future of the coast and the success of protection and restoration projects. Research focused specifically on the needs of the Coastal Master Plan can improve outcomes for both the protection and restoration components of the program.

RESEARCH NEEDS

- Develop techniques to improve meteorological forcings on coastal systems models (e.g. wind speed and direction, precipitation)
- Evaluate effects of different assumptions about coastal storm character and frequency on assessments of future coastal flooding
- Improve modeling of storm effects (winter and tropical) and waves, and interdependence between the two, on restoration projects
- Understand variability in wave dynamics including wave regeneration, inlet bathymetry, nearshore salinity and sediment transport during normal and storm conditions to improve predictive models (Also see Topic 5)
- Improve storm surge models by coupling hydrologic and coastal hydraulic flooding processes (Also see Topic 5)
- Develop efficient approaches to integrated/coupled systems modeling to capture storm-related changes, such as predicting failure of engineered structures (e.g. levees) (Also see Topic 3)

OUTCOMES

Outcomes may include: improved capability or predictive models for physical climatic processes; a better understanding of coastal storms that would lead to model improvement; and refined storm surge models based on a more complete suite of elevation data

Topic 7: Socioeconomics, including environmental sociology, rural and urban planning, cultural anthropology, hazards geography and coastal industrial and resource economics

RATIONALE

The Coastal Master Plan has increased its focus on communities and resiliency while sustaining the coastal ecosystem. The dramatic changes that have occurred across the coast of Louisiana in the last century, as well as the annual threat of storm surge flooding, make considering effects of the Coastal Master Plan in the next 50 years even more challenging. As well as an objective concerned with protection from storm surge flooding, the Coastal Master Plan addresses sustaining cultural heritage and supporting the working coast. Targeted research that increases understanding of recent and potential future change in social and economic conditions across the coast will be important for achieving these objectives.

RESEARCH NEEDS

- Explore and evaluate ecosystem services and associated values of coastal habitats in areas experiencing ongoing or predicted habitat shifts and coastal restoration activities (Also see Topic 2)

- Investigate effective approaches to integrate socio-ecological systems (i.e. human-natural systems) and coastal community resilience to improve coupling of the planning and implementation of coastal protection and restoration projects (Also see Topic 3)

- Investigate sociological views of restoration (i.e. societal expectation, views, perceptions, and attitudes), and effects of educational tools on attitudes and expectations, and develop best practices to improve community interaction with Master Plan activities

- Develop applied social science research and/or develop tools that enable consideration of social indicators of recovery, risk perception, social capital, and socio-economic vulnerability in decision making

- Document endangered cultures and peoples of Louisiana to ensure incorporation of vulnerable communities and locations into Coastal Master Plan analysis, modeling and project selection

- Investigate methods to coordinate, integrate and encourage coastal parish future land use planning efforts that are consistent with the Coastal Master Plan and account for future flood risks

- Evaluate success of existing efforts to develop and integrate non-structural methods of hazard mitigation into protection planning and best practices for implementation and gauging program success (Also see Topic 3)

- Assess how various state-wide/federal efforts approach pre/post disaster redevelopment and hazard mitigation planning and how their efforts could be applied to Louisiana

- Investigate new models for coastal or hazard mitigation zoning codes, or other flood ordinances that include hazard mitigation or flood risk reduction elements to protect current and future community development and recovery

- Investigate best practices and adaptation strategies for at-risk communities to climate-related coastal hazards, incorporating traditional ecological knowledge (Also see Topic 7)

- Expand documentation, information and analyses of repetitive losses to mitigate future loss to property

- Investigate and develop innovative and equitable resettlement and relocation policy approaches that increase options for affected households, reduce risk and build more resilient communities

- Develop easy–to-use approaches to readily incorporate sea level rise and subsidence projections into parish and local comprehensive and hazard mitigation plans (See Topic 6)

OUTCOMES

Outcomes may include: increased understanding on the relationship between the parish planning elements of disaster management, resilience, freight and passenger transportation, environmental planning and economic development; best practices of planning integration at the parish level; identification of innovative and equitable resettlement and relocation policies that increase options for affected households, reduce risk and build more resilient communities; aid state and local governments in identifying mitigation projects, short and long-term planning; reduce the number of repetitive loss properties through increased use of flood mitigation methods; evaluation of various natural, social, and economic predictive factors that affect coastal community resilience; simulation of scenarios based on a better understanding of the linkages and feedbacks between the natural and human components to evaluate long-term coastal resilience

Topic 8: Regulatory policy issues

RATIONALE

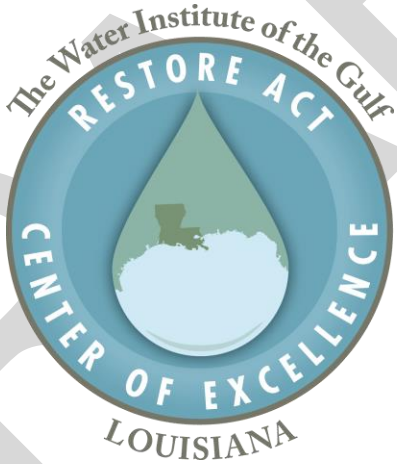
Project implementation in coastal Louisiana must be conducted in the larger context of national regulations while also working with the concerns and desires of local governments and citizens. Understanding the limitations and opportunities presented by this larger policy context is important to expedite implementation, anticipate potential issues early, and work as appropriate to develop solutions that enable implementation to proceed.

RESEARCH NEEDS

- Investigate legislative/policy changes that would improve the state's ability to implement projects by reducing delays or eliminating unnecessary requirements
- Evaluate alternatives to Corps of Engineers New Orleans District standard operating procedures regarding Federal Standard and maintenance dredging to maximize the beneficial use of dredged material
- Investigate statewide standards and best practices for parish comprehensive plans that recommend all future development consider climate change impacts, and are consistent with the Coastal Master Plan (Also see Topic 6)
- Investigate policy adjustments to floodplain and zoning requirements that could better enable adaptation by coastal citizens to geophysical changes, including policies on redevelopment in highly flood prone or vulnerable areas after a storm event (Also see Topics 6 and 7)
- Conduct an assessment of comprehensive plan and/or hazard mitigation plan implementation effectiveness to better determine on the ground impacts and implementation challenges and investigate best practices for integrating hazard mitigation plans with other planning processes including the Master Plan
- Investigate the interaction between community insurability/financability and coastal change and restoration

OUTCOMES

Outcomes can include: more robust integration between the Coastal Master Plan and parish and local plans; and identification of opportunities to use incentives to encourage parish and local governments to bring their plans and actions in line with the Master Plan



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