Research Needs

RESTORE Act Center of Excellence for Louisiana

February 12, 2019

ABOUT THE RESTORE ACT CENTER OF EXCELLENCE FOR LOUISIANA

The mission of the RESTORE Act Center of Excellence for Louisiana (LA-COE) 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 LA-COE 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 please visit LA-COE.org.

SUGGESTED CITATION

RESTORE Act Center of Excellence for Louisiana. 2019. Research Needs. The Water Institute of the Gulf. Baton Rouge, LA.

Preface

This document is a core component of the RESTORE Act Center of Excellence for Louisiana (LA-COE). It informs the priority of the competitive research needs that the LA-COE supports and is focused on issues pertinent to coastal Louisiana with emphasis on advancing Louisiana's Coastal Master Plan in consideration of climate change. This document identifies key topical research needs, including rationale underlying these needs and the potential outcomes that can be applied to support the refinement and implementation of the Coastal Master Plan. This document may also be useful to other programs that seek to support research that furthers sustainable and resilient natural and human communities in coastal Louisiana.

Table of Contents

Glossary of Terms

Term	Definition (as used in this document)
Nonstructural risk reduction	Methods to elevate and floodproof buildings and help property owners prepare for flooding or move out of areas of high flood risk.
System dynamics	Approach to understand the complexities of an ecosystem including the relationships, interactions, feedbacks, and time lags between the organisms and their physical environment.
System-wide	Relating to evaluating natural processes throughout the ecosystem, habitat, or basin-wide scale.
Ecological benefits	Support to ecosystem functions, supporting an intact ecosystem, or increasing habitat for important flora and fauna.
Project performance	Whether a project as built or implemented achieved its stated objectives in terms of desired ecosystem structure, function, and/or ecosystem services provided.
Hard structure	Engineered feature made of concrete, rip-rap, rocks or similar material.
Natural defense	Leveraging existing coastal habitats and features through conservation and restoration practices to protect communities.
Human dimensions	An aspect of understanding how people interact with their environment.
Resilience	The ability of a system, community, or society exposed to hazards to resist, absorb, accommodate, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.
Tipping point	A level of change in system properties beyond which a system reorganizes, often abruptly, and does not return to the initial state even if the drivers of the change are abated.

Acknowledgements

Researchers from Louisiana academic institutions who participated in the development of Version 1 (V1) of the Research Strategy as Technical Working Group members include Mark Davis, Allyse Ferrara, Ioannis Georgiou, Kevin Gotham, Scott Hagen, Malay Ghose Hajra, Mark Hester, Brian Roberts, Torbjorn Tornqvist, Jay Wang, and Clint Willson. Research Strategy Contributing Experts provided support to Technical Working Group members and participants of the Coastal Research Priorities Town Hall also provided input to the Research Strategy V1, which was co-hosted with Louisiana Sea Grant on October 3, 2016. Angelina Freeman, James Pahl, Richard Raynie, Syed Khalil, Mark Leadon, Ed Haywood, Zachary Rosen, Brian Vosburg, Leigh Anne Sharp, David Lindquist, Elizabeth Davoli, Roy Bergeron, David Peterson, Melanie Saucier, and Mandy Green of the Coastal Protection and Restoration Authority (CPRA) of Louisiana provided guidance and assistance with identifying research needs relevant to the Coastal Master Plan. Team members including Tim Carruthers, Mead Allison, Scott Hemmerling, Ehab Meselhe, Melissa Baustian, Alyssa Dausman, and Alaina Grace of The Water Institute of the Gulf also offered support during the updating (V2) of this document now referred to as Research Needs. Elizabeth Davoli, Angelina Freeman, Andrea Galinski, Mandy Green, Shannon Hayes, Ed Haywood, Krista Jankowski, Russ Joffrion, Mark Leadon, Glenn Ledet, David Lindquist, James Pahl, and Zachary Rosen of CPRA contributed priority agency research needs and guidance during updating of this document. Lastly, the External Review Board provided valuable comments to strengthen the document.

This project was paid for with federal funding from the U.S. Department of the Treasury through the Louisiana Coastal Protection and Restoration Authority's Center of Excellence Research Grants Program under the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act). The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the U.S. Department of the Treasury.

Executive Summary

The Water Institute of the Gulf (the Institute) was selected by the State of Louisiana's Coastal Protection and Restoration Authority (CPRA) to serve as the State's RESTORE Act Center of Excellence (LA-COE). On November 1, 2015, the U.S. Department of the Treasury awarded CPRA a grant to begin its research program. This followed submission of a proposal to CPRA from the Institute 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 most sound and 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 LA-COE 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 the document of priority research needs to inform competitive research that the LA-COE supports, this Research Needs document focuses on issues pertinent to coastal Louisiana with emphasis on advancing Louisiana's 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 Research Needs document broadly outlines research, modeling, and monitoring needs for informing Louisiana's Coastal Master Plan. Information is provided on the rationale or the articulation of the scientific and technical problems underlying these research needs, and the potential outcomes to directly support the Coastal Master Plan. This document is also intended to be a primary source for crafting future "Request for Proposals (RFP)" for the LA-COE. The document includes a list of research needs under various categories. These needs were identified primarily by scientists, engineers, and planners from CPRA with contributions from scientists and engineers at the Institute. Additional input was solicited from academic institutions. The document provides a broad framework to guide future RFPs to draw from in a manner that would address cross-disciplinary and applied research questions. Future RFPs will emphasize and outline specific applied research questions and the related needs that must be addressed to meet CPRA's planning, design, and project implementation needs. These needs are often cross-cutting through the various disciplines and topical areas as outlined in the document. These research questions will be prioritized then organized around themes that would ultimately define the overall emphasis of any given RFP. It is noteworthy that the list of topics outlined below should not be considered an exhaustive list of important research needs. The research needs herein are topics of high priority to CPRA and are currently underfunded. There are other important topics not included in this strategy as they are currently being addressed by other sources of national research funding such as National Science Foundation, National Oceanic and Atmospheric Administration, National Academy of Sciences, or regional sources such Louisiana Sea Grant, etc.

Research needs (in no particular order) are categorized into five topical areas:

- Topic 1: Hydrology and Hydrodynamics of Riverine, Estuarine, and Coastal Systems
- Topic 2: Estuarine and Coastal Ecology
- Topic 3: Geotechnical, Structural, and Coastal Engineering
- Topic 4: Deltaic Geology, Geomorphology, Subsidence, and Sediment Dynamics
- Topic 5: Human Dimensions

In its entirety, this document provides guidance on the use of LA-COE research funds and identifies important research needs to further sustain 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 Resources and Ecosystem Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States (RESTORE) Act. The Act established the Gulf Coast Restoration Trust Fund in the U.S. Department of the 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% 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 $26.6 million through 2031. Collectively, these Centers of Excellence are known as the Centers of Excellence Research Grant Program and they coordinate to leverage resources and minimize or avoid duplication. Each Center of Excellence works closely with a state entity to administer a competitive grants program and to ensure that research results are aligned with eligible disciplines and support effective policy and ecosystem management.

On January 6, 2014, the Water Institute of the Gulf (the Institute), in collaboration with academic partners from Louisiana, submitted a proposal to the State of Louisiana's Coastal Protection and Restoration Authority (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 November 1, 2015, the U.S. Department of the Treasury awarded CPRA a grant to begin its research program. The Institute was selected by CPRA to serve as the State's RESTORE Act Center of Excellence (LA-COE).

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

1. 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
2. Coastal fisheries and wildlife ecosystem research and monitoring in the Gulf Coast Region
3. Offshore energy development, including research and technology to improve the sustainable and safe development of energy resources in the Gulf of Mexico
4. Sustainable and resilient growth, economic and commercial development in the Gulf Coast Region
5. Comprehensive observation, monitoring, and mapping of the Gulf of Mexico

The topics included in this Research Needs document are related to the objectives of the 2017 Coastal Master Plan and are closely aligned with the disciplines (Table 1). Working within these disciplines, the mission of the LA-COE is to support research directly relevant to implementation of Louisiana's Coastal

Master Plan. While the Coastal Master Plan supports Louisiana and the people who live and work on the coast, discipline #3 does not directly relate to the implementation of the Coastal Master Plan, therefore the LA-COE does not focus on #3. 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 regularly updated, providing an opportunity for new knowledge and understanding to be incorporated. In addition, ongoing project implementation, operation, and maintenance use 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 LA-COE is one vehicle through which research is targeted towards supporting implementation of the Coastal Master Plan.

This Research Needs document serves as a revised version of the Research Strategy V1. Topics from the first version have been refined and reduced to more strategically guide the competitive research that the LA-COE supports, which includes research needs focused on issues pertinent to coastal Louisiana with emphasis on advancing Louisiana's Coastal Master Plan. This Research Needs document is intended to identify research topics and needs with potential to develop knowledge and research outputs directly applicable to implementation of the Coastal Master Plan.

Table 1. Comparison of the 2017 Coastal Master Plan objectives with the Research Needs (RN) topics and their alignment to the U.S. Department of the Treasury's eligible disciplines.

Eligible Disciplines of the U.S. Department of the Treasury	Objectives of the 2017 Coastal Master Plan				
	Flood Protection *RN Topic 2,3,4*	**Natural Processes** *RN Topic 1,2,3,4*	**Coastal Habitats** *RN Topic 1,2,3,4*	**Cultural Heritage** *RN Topic 5*	**Working Coast** *RN Topic 3,5*
1. **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	X	X	X	X	X
2. **Coastal fisheries and wildlife** ecosystem research and monitoring in the Gulf Coast Region		X	X		X
4. **Sustainable and resilient growth** economic and commercial development in the Gulf Coast Region	X			X	X
5. **Comprehensive observation,** monitoring, and mapping of the Gulf of Mexico	X	X	X	X	X

The following guiding principles serve to address and fulfill these objectives:

- Knowledge and understanding developed will be used in the regular updates of the Coastal Master Plan
- Research findings will be used to increase efficiency, enhance reliability, and reduce uncertainty associated with Coastal Master Plan implementation
- Research needs addressed now will improve long-term outcomes as the Coastal Master Plan will continue to be implemented for decades
- The research community's broad appreciation of coastal system dynamics, including natural, restoration and protection responses, and social and economic aspects, will be leveraged to support the Coastal Master Plan
- All data will be publicly available through repositories and coordinated with existing groups such as the Gulf Monitoring Community of Practice

Initial 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 resulting Research Strategy (V1) was used to guide the inaugural Request for Proposals (RFP). This Research Needs document used the existing Research Strategy (V1) and updated the research needs. Each of the topics herein include the rationale underlying the needs, identify research needs, and identify potential outcomes or tangible management implications in support of the Coastal Master Plan. The list of research needs is not intended to be an exhaustive list. There are important needs not included here because they are being addressed by other funding sources (e.g. federal, state, or other). The lists provided herein are not merely examples; the items were identified jointly by the technical staff and researchers at CPRA and the Institute.

The first research awards from the RFP1 competition have been issued. Both project summaries and awardee information can be found at LA-COE.org. Future RFPs will extract from the broad list of research needs herein depending on the specific needs of CPRA at the time of releasing each individual RFP. The sequence and interdependencies of the topics and research needs as well as the available funds will be considered by LA-COE and CPRA to guide future RFPs and research awards. Future RFPs may only consider a few of the research topics or needs in any particular RFP that will target knowledge gaps and priorities set forth by CPRA and a strategic approach will be described for that funding cycle. The exact timing of future RFPs is unknown. Future RFPs will follow the processes, including the independent review processes, as detailed in the Standard Operating Procedure (Version 2), available at LA-COE.org.

Topic 1: Hydrology and Hydrodynamics of Riverine, Estuarine, and Coastal Systems

RATIONALE

Understanding the hydrology and hydrodynamics of Louisiana's riverine and coastal systems is critical to identifying and evaluating innovative restoration and protection strategies. Managing the riverine freshwater resources and the mixing processes with the marine environment is also critical for the sustainability of coastal habitats. Further, the long-term trends of these processes, in response to climate change, needs exploration to support the Coastal Master Plan implementation.

RESEARCH NEEDS

- Determine the effects of relative sea level rise on the saltwater wedge dynamics in riverine and coastal water bodies (e.g. Mississippi and Atchafalaya Rivers, Calcasieu Ship Channel).
- Collect high fidelity wave attenuation data under a wide range of conditions (e.g. fair weather, winter storms, severe storms).
- Explore strategies to measure and estimate a water budget including the surface-groundwater exchange between the Mississippi River and adjacent estuaries; and investigate the impact of groundwater surcharge on soil stability and salinity dynamics in the River and adjacent bays.
- Apply meteorological and oceanographical forcing parameters in coastal dynamics models (e.g. wind speed and direction, precipitation, wind-driven waves, air and water temperature) that are accurate under both normal and storm conditions.
- Integrate probabilistic/stochastic external forcings and events (e.g. relative sea level rise, storm character, Gulf of Mexico sea height, El Niño-Southern Oscillation) into predictive models.
- Better quantify and model surface and subsurface water flow from inland to the coastal zone to assess potential impacts of upland removal of freshwater from rivers or groundwater and its links to coastal ecosystem conditions.
- Incorporate climatology and hydrology, including the joint probability and distribution of rainfall and storm surge scenarios into numerical planning models.
- Analysis, testing, and installation guidance for bank stabilization (e.g. articulating concrete blocks) of high-velocity conveyance channels for river diversion projects in coastal Louisiana soils.
- Calibration and validation of parameters and coefficients for influence of vegetation on flow velocities and sediment transport for river diversions.

OUTCOMES FOR COASTAL MASTER PLAN IMPLEMENTATION

- Better understanding of the salt-wedge dynamics in coastal, riverine and deep coastal ship channels to help assess the impact of saltwater intrusion on proposed restoration projects in future Coastal Master Plan cycles and ensure that their design accounts for such impacts.
- Comprehensive wave attenuation dataset to support understanding the wave field in coastal Louisiana and to support the development and validation of wave models.
- Validated high-resolution wave models for evaluating projects in coastal Louisiana.
- A system-wide water budget, backed by quantitative modeling and a robust monitoring network, will provide scientific guidance into how the State of Louisiana can manage freshwater for all its uses, and maintain its critical functionality for coastal ecosystems and the viability of Coastal Master Plan projects.
- Design guidelines and recommendations for bank stabilization and erosion-prevention techniques within high-velocity channels (e.g. diversion outfall channels).
- Water budget capturing the exchange between surface and groundwater for the Lower Mississippi River and adjacent bays, with insights on possible strategies to incorporate such knowledge in the design and implementation of restoration/protection projects.

Topic 2: Estuarine and Coastal Ecology[1]

RATIONALE

Providing storm protection and sustaining coastal habitats to support recreational and commercial activities are objectives of the Coastal Master Plan. Restoration and protection projects implemented to meet these objectives will have multiple effects on Louisiana's soils, plants, fish, and wildlife. Understanding the range of effects, as well as how they interact, is important to inform and prioritize actions. Significant drivers of change in ecological resources include relative sea level rise, increasing air and water temperatures, nutrient dynamics, changes related to climate and weather such as rainfall quantity and intensity, and watershed land cover and land use.

RESEARCH NEEDS

Nutrients, Vegetation and Soil

- Improve quantification of nutrient sources, sinks, and transformations, including salinity gradients and watershed processes, at multiple spatial scales. For example, improve understanding of transformation and assimilation pathways for nutrients within watersheds and receiving basins, including water quality, soil, primary and secondary producers and the potential for ecosystem changes such as estuarine hypoxia.
- Determine the soil strength parameters that are most relevant to Coastal Master Plan project planning and implementation, develop new and efficient approaches for measuring these parameters, and increase understanding of ecological processes influencing soil strength.
- Increase understanding and quantification of processes affecting marsh surface elevation, in the context of relative sea level rise, as influenced by emergent vegetation, specifically rates of organic matter incorporation and carbon accumulation. Additionally, improve knowledge of feedback processes between inorganic sediment accretion and growth of emergent marsh vegetation.

Terrestrial and Aquatic Fauna

- Determine the effects of natural ecosystem changes and protection and restoration projects on the abundance, distribution, movement patterns, growth, food web stability, and trophic dynamics of ecologically- and economically-important freshwater, estuarine and coastal biota (including all life history stages of phytoplankton, infauna, shellfish, fish, birds, submerged aquatic vegetation, and key wildlife species).
- Determine fish and wildlife use of created or restored marsh, ridge, and barrier island habitats.

OUTCOMES FOR COASTAL MASTER PLAN IMPLEMENTATION

- Improved quantification of estuarine and coastal ecosystem change resulting from no action, or with restoration and protection actions to inform the choice of restoration and protection actions that will optimize ecological benefits of restoration in different locations or different ecotypes.
- Increased data on ecological processes and floral and faunal populations to support Coastal Master Plan prioritized model development as well as improve existing models via calibration/validation exercises for improving future predictions of estuarine and coastal conditions with and without restoration actions, as prioritized through Coastal Master Plan modeling needs.
- Increase understanding of ecological responses to restoration and protection project designs to maximize use by key fish and wildlife species.

[1] including fish, shellfish, wildlife, plankton, vegetation and nutrient dynamics

Topic 3: Geotechnical, Structural, and Coastal Engineering

RATIONALE

The geotechnical properties in coastal and deltaic soils are quite complex, and accounting for their strong heterogeneity while implementing and constructing restoration and protection projects remains challenging. A thorough understanding of geotechnical soil properties is required to adequately design and construct flood protection and restoration projects within Louisiana's coastal zone. Analysis of comprehensive monitoring data of barrier island / barrier shoreline restoration project performance can map sediment distribution and pathways and guide on-going and future resource management and improved design of these projects.

RESEARCH NEEDS

- Develop standardized geotechnical laboratory testing procedures for hydraulically-dredged slurry for marsh fill material.
- Analyze the use of seawalls, breakwaters, terminal groins, and other hard structures as barrier island / barrier shoreline protection and erosion control measures.
- Improve coastal systems analysis techniques for monitoring and sediment management of marsh creation, sediment diversion, and barrier island / barrier shoreline restoration projects and adjacent tidal inlets (e.g. sand retention, sand bypassing, beach re-nourishment).
- Design guidance for soil-structure interaction parameters for braced flood-protection structures such as vertical walls. The design standards should carefully consider the impact of climate change and non-stationarity of events and storms (both in terms of intensity and frequency). The design standards should be adaptive to keep pace with such changes.
- Develop and use remote sensing techniques and technology for project and ecosystem monitoring that can directly benefit CPRA by reducing costs, improving data quality and filling data gaps.

OUTCOMES FOR COASTAL MASTER PLAN IMPLEMENTATION

- Improved strategies for maintaining levees and other flood protection projects to withstand climate change challenges. Guidance on how engineering-based approaches could be accomplished without encouraging further development within vulnerable (high risk) regions.
- New and/or improved guidelines for marsh fill and creation projects; use of hard structures for shoreline protection and erosion control; and techniques for monitoring sediment management restoration projects (e.g. barrier islands and shoreline protection).
- New and/or improved techniques for assessing coastal restoration project engineering performance and on-going management of project and adjacent tidal inlet sand resources.

Topic 4: Deltaic Geology, Geomorphology, Subsidence, and Sediment Dynamics

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 challenges. Few other major protection and restoration programs provide a precedent to address the importance of geologic controls on projects, such as those in southern Louisiana. In addition, the barrier shorelines, coastal wetlands, shallow estuaries, and shoreface-inner shelf of Louisiana are the foundation upon which the productive ecosystem is based and are critical to humans that live in coastal Louisiana. Linking the geomorphic evolution of these environments to surface geology and groundwater hydrology, and to sediment dynamics, is key to predicting their future evolution and to evaluating the benefits of projects. Targeted research in this area can help reduce uncertainty and/or quantify appropriate bounds of geologic dynamics on project feasibility, design, implementation, and adaptive management.

RESEARCH NEEDS

- Identify and quantify the role of individual mechanisms of subsidence, including both natural (e.g. sediment compaction) and human-induced (e.g. fluid withdrawal). Define the role, if any, of fault-salt tectonics in causing subsidence on project lifespan timescales. Once subsidence mechanisms are characterized and understood, develop and apply novel predictive subsidence modeling approaches.
- Use remotely sensed, high-fidelity elevation change data (e.g. LiDAR, InSAR, etc.), or other types of remotely sensed data throughout coastal wetlands to examine and better understand system evolution on short (annual to decadal) timescales. Identify gaps and improve or develop methodologies for processing remotely sensed data to improve understanding of system evolution.
- Use stratigraphy, geochronology, and other types of data or methodologies to develop three-dimensional architecture of the coastal subsurface to better understand the small-spatial-scale heterogeneity of the Delta and Chenier Plain subsurface geology. This is key to interpreting subsidence patterns which will improve model predictions about lobe and crevasse splay evolution.
- Improve predictive capabilities of destructive coastal processes on deltaic-chenier coastal land areas (e.g. sand shoreline dynamics, wetland edge erosion, estuarine and shelf floor deflation), and how these processes operate under normal and storm conditions.
- Evaluate the effectiveness and impacts of individual project restoration strategies (e.g. hard structures, natural defenses, hydrological network modifications) on the larger Louisiana continental shelf and coastal and estuarine ecosystems to predict both positive and negative project and project-type feedbacks. This also includes identifying sediment sources, inventory, and budget, and impacts of sediment resource removal—such as the impact of borrowing in shelf and estuarine settings.

OUTCOMES FOR COASTAL MASTER PLAN IMPLEMENTATION

- Predictive models are updated with the rates and impacts of subsidence in coastal Louisiana, resulting in more accurate simulations of project viability and lifespan.
- Key parameters in numerical models are updated and more accurately reproduce splay evolution in sediment diversions.
- Project designs are updated to increase project performance and their ability to buffer communities, infrastructure, and ecosystems.
- Coastal Master Plan project prioritization is improved by integrating updated assessments of coastal geology, geomorphology, subsidence, and sediment dynamics, including a sediment inventory and budget.

Topic 5: Human Dimensions

RATIONALE

Even with full implementation of the Coastal Master Plan, land loss in some locations will continue, while in other locations land area will be largely maintained. Residents of communities outside the major levee systems may require some form of nonstructural protection and in other cases, adverse future environmental conditions may displace people, infrastructure, and likely even entire communities. Even if the planned risk reduction systems (both structural and nonstructural) and restored coastal habitats identified in the Coastal Master Plans are implemented, some degree of residual storm surge-related risk will remain. The resilience of coastal Louisiana is dependent on maintaining the cultural, social, and economic viability of coastal communities in the face of expected environmental changes. The key objective of the Human Dimensions research topic is to enhance our fundamental understanding of the impacts of Louisiana's coastal crisis on residents and communities and to apply concepts and empirical findings to contemporary, real world problems of coastal planning and management. Research studies can draw from several broad themes, including environmental sociology, rural and urban planning, cultural anthropology, hazards geography, and coastal industrial and resource economics.

RESEARCH NEEDS

Population Change and Social Sciences

- Develop dynamic metrics to calculate the social impacts (e.g. population change and composition, place attachment and identify, effects on social equity, public health, impacts on low to moderate income population, changes to infrastructure and critical services such as schools, health services, etc.) of individual restoration and risk reduction projects, future without action, and suites of projects on coastal communities.
- Identify the key drivers of coastal population shifts and methods to project those shifts over time. Identify coastal communities that may be expected to receive an influx of population over time, as well as those expected to decrease in population over time.

Planning and Built Environment

- Evaluate the impacts of coastal land loss and future coastal protection and restoration activities on adaptive capacity of communities, health services delivery, specific governmental sectors, businesses and industries, or other social services.
- Evaluate the capacity of inland/upstream coastal communities to handle population growth in terms of planning for the built environment and infrastructure. Identify how population changes and future flood risk may influence housing development policy, transportation systems, water/wastewater systems, and other key sectors for coastal parishes in context of both urban and rural communities.
- Evaluate the quality of state and local plans including land-use plans, comprehensive plans, and hazard mitigation plans, and develop methods and best practices for integration of state and local planning efforts in Louisiana that draw from efforts internal and external to Louisiana. Develop methods to encourage coordinated integration of future land loss, flood risk, and climate change impacts into coastal parish planning efforts, and to evaluate the effectiveness of plan implementation.

Coastal Economy

- Valuate ecosystem services and quantify the linkages between ecosystem services provided by coastal habitats and the economic, social, and cultural well-being of coastal residents and communities using primary (e.g. surveys and interviews) and secondary data sources.
- Quantify the economic linkages between the Gulf of Mexico, coastal communities, and regional urban hubs and identify system vulnerabilities and pain points (real and perceived) that may adversely impact business operations (e.g. identifying the linkages from fishers to ports/docks to transportation to wholesalers to retailers).
- Identify and assess the benefits, both monetized and non-monetized, of coastal protection and restoration projects identified in the Coastal Master Plan, beyond they typical emphasis on future losses avoided.

Risk Communication

- Identify communication techniques (via community meetings, social media, etc.) related to future flood risk perception and individual decision making that result in increased 1) participation in the Flood Risk and Resilience Program, 2) awareness and support of Coastal Master Plan restoration and risk reduction projects, and 3) science communication to the public, media, and formal educators.

OUTCOMES FOR COASTAL MASTER PLAN IMPLEMENTATION

Improved planning and management at the state and local level to reduce risk, improve financial and social conditions, and build more resilient communities through:

- A qualitative and quantitative understanding of the social impacts of a future without action compare to a future with coastal protection and restoration projects (individually and as a suite of projects).
- An understanding of how, why, and where people relocate due to coastal risk and/or environmental change.
- Anticipating impacts of coastal hazards and/or environmental change on the delivery of critical and essential services (e.g. transportation, water delivery, wastewater treatment) and how these are affected by coastal protection and restoration projects.
- Better preparation for population transitions that reduces strain on existing communities due to anticipated population growth/decline.
- Strengthened adaptation efforts due to increased community investment in transitional efforts (e.g. policy change, non-structural protection projects, relocation, changes to service provision).
- An improved understanding of the vulnerability of coastal industries and the coastal economy to risk and/or environmental change.

1110 River Road South, SUITE 200
BATON ROUGE, LA 70802

(225) 448-2813
WWW.LA-COE.ORG