Opportunities for Impact Investment in Coastal and Water Management

Louisiana Board of Regents

Master Plan Research Advisory Committee

Coastal and Water Management Task Force

October 31st, 2014

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Coastal and Water Management

Introduction

Currently, 39% of the population in the United States (123 million people) lives in coastal counties, with an average population density more than 4 times the national average (NOAA State of the Coast 2014). In Louisiana, it is estimated that more than half of the State's population lives within 50 miles of the coast. It is also estimated that the State's 'working coast' is embedded with infrastructural assets valued at $150 billion that support a population of >2M, the largest port in the U.S., and an economy worth $12-47B (Batker et al., 2014). Louisiana's coastal zone contains 40% of the U.S. wetlands (2000-2005 land loss rate of rate of ~100 km^2/y)(USGS, 2007). A majority of the offshore and deep-water oil and gas production for the Nation comes from Louisiana. Sea level will continue to rise as global temperatures increase, along with a prediction for increasing severe weather patterns. Louisiana's predicted rate of relative sea-level rise is > 1 cm/y, as opposed to 0.2-0.4 cm/y for other Gulf states and for the east and west U.S. coasts. In short, the Louisiana coast is a critical working asset for the nation, but its residents and infrastructure are literally under siege.

In addition, water itself is essential for economic development in Louisiana. The state's core economic sectors require enormous quantities of high-quality water. Louisiana is the third leading producer of rice in the U.S. and is a global hub for the upstream and downstream petroleum industry, including a variety of chemical producers. The state also hosts 40% of the nation's freshwater wetlands which are critical to the seafood industry and serve to mitigate flooding. Louisiana's groundwater resources are already being tapped at unsustainable rates, leading to salt water intrusion in the capitol area and near the coast and loss of base flow in streams in the northern part of the state. Without new coastal and water management practices and technological advancements there will not be enough available water to sustain economic growth in these areas or the emerging high growth target industries associated with coastal resilience and energy production.

Focal Opportunities for Investment

Given the pivotal role coastal community infrastructure and water resource management play in the future economic development of the State, we have identified three focal opportunities for investment in Louisiana universities that would promote sustainable innovation, technological commercialization and high impact returns. Capitalizing on existing pools of expertise and research infrastructure, targeted investments would further establish Louisiana as a leader in issues relating to coastal and water management.

1. *Coastal Resilience Through Next Generation Coastal Science, Engineering, and Management*

Risks to coastal regions and their ecosystems and socioeconomic systems are worldwide, but especially profound in populated coastal river deltas. This has been recently highlighted by the Department of Defense (2014) as a potential flashpoint for international security ("threat multiplier"). These risks include flooding, land loss, human health, marine transportation, and socio-economic disruption. Further, risks to coastal communities from hurricane inundation and related phenomena are a national priority area particularly on the East and Gulf Coasts, highlighted by the National Academies of Science (2014). While focused on the U.S. Army Corps of Engineers Water Resources programs, the report outlined important strategies for all coastal regions. Shoring up coastal resilience through

wetlands engineering is a major opportunity for investment in Louisiana that will yield tangible economic and social returns.

Louisiana institutions of higher learning have aggressively pursued development of programs and collaborations to address these challenges. Great efforts have been made despite nearly a decade of demoralizing and debilitating financial reductions of institutional resources. These partnerships are ripe for investment that, if provided, will help stabilize key portions of the degrading coastline, build employment, and foster economic growth in the burgeoning area of coastal and water science, engineering, and management (SEM).

<u>High Impact Investment Opportunities</u>

In support of this focal area, the state, academic institutions, and industry partners have an opportunity to expand investments that will maintain and build strength in targeted foundational science and technology disciplines identified in FIRST Louisiana and promote multidisciplinary and multi-institutional research efforts. These investments are also consistent with state and federal priorities.

A) Research Commercialization and Translational Activities
- Investment in key multi-institutional facilities is critically needed. These investments will foster intellectual and economic growth in coastal/water SEM, and allow rebuilding of core academic programs.
- Academic leadership (hiring senior and rising-star researchers) including endowed chairs in this focal area is needed to provide truly innovative scholarship and expand capabilities in key fields, including but not limited to engineering risk/reliability, and geodesy/geoinformatics.

B) Workforce Development
- Academic institutions should provide innovative academic and research programs that enhance undergraduate and graduate training (quality and numbers of graduates), and basic and applied research in coastal/water SEM. This response should include high-performing institutions that presently do not house academic programs directly focused on coastal/water SEM, such as Louisiana Tech and Xavier University of New Orleans.
- Graduate training in these science, engineering, and policy fields is needed.

<u>Impacts</u>

The State of Louisiana's Blue Ocean Plan and recent external reviews have highlighted coastal/water SEM as a key area for economic growth. This can only occur if both core academic programs and coastal/water programs receive adequate investment. The present Louisiana Blue Ocean Plan targets job growth of 10,000-20,000 jobs over the next 16 years, or 625-1250 new jobs per year. A substantial number of these new positions could be filled by highly qualified Louisiana graduates from the institutions that presently produce (or will soon produce) graduates in these areas, especially with additional core and coastal/water SEM investment. If salaries for these new jobs are ~$75,000, the economic impact of salary alone would be $800-1,6000M per year. Beyond salary dollars alone, this

economic growth would drive vital activities to secure our coastal zone against environmental threats, and also the development of intellectual capital for export in the coastal/water SEM sector.

Key Assets:
Baton Rouge Water Campus / River Model Facility
Louisiana Universities Marine Consortium
Tulane University Riverfront Campus for Applied Coastal Sciences and Engineering
LSU Coastal Studies Institute
LSU School of the Coast and Environment
LSU Center for Computation and Technology, and affiliated computational hubs
Academic Programs in Coastal Science and Engineering
Louisiana Department of Transportation and Development
Coastal Protection and Restoration Agency
The Water Institute of the Gulf
ULL Center for Ecology & Environmental Technology
ULL Institute for Coastal Ecology & Engineering

People/Groups:
Endowed chair in coastal/hurricane hazards and director of LSU Hurricane Center
Tor Tornqvist (Tulane)
Kyle Straub (Tulane)
Endowed chair in geophysical sciences (Dept of Earth & Env Sciences, Tulane)

Recent Successes:
2014-18   Twilley R, Bentley S, Chen Q, **Lam NSN**, Xu K. 2014. DELTA SEES: Sustainability of deltaic coastlines – the trillion dollar problem. *National Science Foundation*. $1,600,000 (Total award), $1,100,000 (LSU portion). 09/01/2014-08/31/2018.
2012-15   Rabalais, Nancy et al. BP-funded Gulf of Mexico Research Initiative to LUMCON for Coastal Waters Consortium (12 University Consortium)

Louisiana CPRA. 2013 – 2015. Comparison of Vegetation Communities within Barrier Island Restoration Projects of Varying Ages through the Development of a Vegetation Sampling Protocol for the Barrier Island Comprehensive Monitoring (BICM) Program.

The Water Institute of the Gulf/Louisiana CPRA. 2014 – 2015. Expert panel: Modeling Sediment-Diversion Related Nutrient Effects Expert Panel.

The Water Institute of the Gulf/Louisiana CPRA. 2014. Expert panel: Developing Coastwide and Basin-Wide Monitoring Plans for the System wide Assessment and Monitoring Program (SWAMP).

US Army Corps of Engineers/Louisiana CPRA. 2014. Coast 2050 Academic Advisor PPL-24.

The Water Institute of the Gulf/Louisiana CPRA. 2013 - 2014. Expert panel: 2017 Coastal Master Plan Model Development and Application.

The Water Institute of the Gulf/Louisiana CPRA. 2013. Sediment Diversion Nutrient Dynamics Expert Panel.

USGS/SE Climate Change Center. 2012 – 2015. Ecological Implications of Mangrove Forest Migration in the Southeastern U.S.

Louisiana Sea Grant/Louisiana CPRA. 2012 – 2015. Coastal Science Assistantship Program (CSAP) Award (graduate student assistantship and intern support).

BP Gulf Research Initiative LSU ORED. 2012 – 2015. A Multidisciplinary Analysis of Linkages Among Wetland Vegetation, Rhizosphere Microbial Communities and Soil Stability in Response to Oiling.

US Army Corps of Engineers/Louisiana CPRA. 2008 – 2013. Coast 2050 Academic Advisor.

CALFED. 2008 – 2013. Evaluating and Predicting Restoration Thresholds in Evolving Freshwater-Tidal Marshes.

LUMCON: CWPPRA Academic Advisory Group PPL22. January 2012= December 2012.

USGS National Wetland Research Center: Delineation of fresh, intermediate, brackish and saline marsh types of the north Central Gulf of Mexico Coast. September 2012-June 2013

CPRA: Vegetation Module for Louisiana Coastal Protection and Restoration Master Plan, Amnd 1. July 2012-December 2012

CPRA: 2013 Louisiana Coastal Vegetation Survey. 6/1/13 – 5/31/14

TWIG: Develop and apply an approach for interfacing LaVegMod with spatially explicit hydrodynamic models. 4/1/13-10/30/13

TWIG: Phase I modeling for Lower Breton Sound Sediment Diversion: LaVegMod. 7/15/13 – 12/31/15

TWIG: Phase I modeling for Lower Barataria Sediment Diversion: LaVegMod. 7/15/13 – 12/31/15

LUMCON: Wetland Vegetation Class. 7/1/13-7/15/13

TWIG: Task 3.14: 2017 Master Plan Model Development and Application of LaVegMod. 9/1/13-8/31/17.

USGS. Forest hydrology and accretion modeling to evaluate the impacts of Hurricane Sandy (9/15/13 – 9/14/15.

USGS National Wetland Research Center: Development and refinement of vegetation based analytical tools and analysis of the Coastwide Reference Monitoring System (CRMS) dataset. 4/1/14 – 3/31/18,

USGS National Wetland Research Center: Structured decision-making to facilitate multi-stakeholder coastal conservation and restoration under climate change uncertainties: case study on barrier islands of the northern Gulf of Mexico. (6/14-6/15)

GULF RESEARCH INITIATIVE-II. The effect of sediment bioturbators on the biological degradation of petroleum in coastal ecosystems2013-2016.

J. BENNETT JOHNSTON SCIENCE FUND. Infrastructural/equipment support for Macondo/BP oil spill related laboratory research, Parts I and II. 2012-2013.

NATIONAL SCIENCE FOUNDATION. REU suppl. Collaborative Research, RedToL - phylogenetic and genomic approaches to reconstructing the Red Algal (Rhodophyta) Tree of Life. 2013.

US GEOGLOGICAL SURVEY. Assessment of Potential Responses of Piping Plover (*Charadrius melodus*), Co-occurring Migratory Shorebirds, and their Benthic Macro Invertebrate Prey, to barrier island restoration. 2012-2014.

COASTAL SCIENCE ASSISTANTSHIP PROGRAM. Evaluation of Maximum Entropy Models for Assessing the Restoration Scenarios Influence on Coastal Wildlife Populations. 2014-2017.

LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES. Influence of barrier island loss, local translocations, and the Deepwater Horizon oil spill on distribution and survival of brown pelicans in coastal Louisiana, 2012-2014.

GULF OF MEXICO RESEARCH INITIATIVE. The environmental effects of an oil spill on blue crabs in the Gulf of Mexico and the dynamics of recovery: Integrating oceanography and molecular ecology. 2013-2017.

2. *Water Resources Management and Technology*

Water resource management, sustainability, and technology are national priorities. The National Science Foundation, National Academies of Science and Environmental Protection Agency have all developed targeted funding programs in these areas. The U.S. Department of Agriculture's Natural Resources Conservation Service recently developed the "Gulf of Mexico Initiative" for supporting new technologies related to agricultural water resource management in Gulf States including Louisiana. Our universities, by promoting curricula and research priorities relevant to water resources, can ensure that students seize the opportunity to be part of the state and national awakening to the importance of meeting water resource challenges. Water resource management therefore presents a second major opportunity for economic investment and growth.

<u>High Impact Investment Opportunities</u>

A) Research Commercialization and Translational Activities
In order to drive economic growth associated with water resources and technology, we need to encourage technological developments at the university-level that can lead to commercialization. Specific investments may include the following:

- Smart technologies for monitoring, analyzing, and transmitting water data in real-time. This includes the development of new flood forecasting and warning systems.
- Water management computing technologies, including models, innovative software, GIS systems, and support of policy and management decisions (e.g., water quality trading). This area of investment could include a signature facility dedicated to these technologies.
- Green technology solutions for water management problems and infrastructure such as storm water runoff and waste water treatment.
- Technologies that optimize industry water use and reduce discharges, especially processing and re-use of wastewater.
- Research that explores opportunities to replace fresh water with brackish water in industrial and commercial processes.
- Agricultural technologies for water re-use and low-water crop production.

B) Workforce Development
In order to drive economic growth associated with water resources and technology, we need to expand the workforce of highly-skilled people in related STEM fields, including strengthening of multi-disciplinary programs and coordination among universities. Specific investments may include the following:

- Create and support undergraduate and graduate programs in applied science and engineering that emphasize inter- and multi-disciplinary approaches to problem-solving in the areas of water management and technology.
- Encourage linkages among academic programs and industry partners in the area of water resources management and technology. These linkages could be made, for example, through funding of internship arrangements, through faculty training programs, or through investments in research.
- Encourage the inclusion of water resource subject matter in courses taught primarily for future K-12 teachers and promote its use in their classrooms.
- Provide new funding opportunities for fundamental and applied research related to water resources management and technology.
- Enhance coordination and cooperation of water resources teaching and research activities throughout the state. For example, a state-wide water research coordination network and/or annual workshops that target water resources work.

<u>Impacts</u>

Recognition of the important role water plays in Louisiana's agriculture and energy production and processing industries, as well as in coastal restoration and ecosystem services can incentivize efforts to address resource management, technology, or workforce challenges that would reduce the ability to meet the projected demands for water. Focusing on those education and research topics that relate most directly to the demand areas most likely to experience the greatest growth in the years ahead would demonstrate a progressive approach to sustaining a foundational natural resource.

Investments in water resources management and technology will significantly impact on the Science and Technology framework presented in FIRST Louisiana. Water resources are fundamental to four of the six transitional research domains (coastal, environmental, agricultural, energy) and to at least three of the seven core industry science and technology sectors (petrochemical, energy and environmental, and agriculture and wood products) in FIRST Louisiana. The high-growth target industries of coastal resilience and energy production are also underpinned by water resource management.

Finally, the role that water quality and quantity plays in sustaining natural systems critical to the state's economy should be an important element in efforts to educate our citizens about water resources. Most Louisianans can directly relate to the use of marshes, estuaries, rivers, streams, lakes, and wetlands for recreational or commercial purposes. It is important for them to also understand that industry, energy production, and agriculture are directly affected by the quantity and quality of the state's water resources. Fostering this appreciation will increase broad and sustained support for these activities in Louisiana.

<u>Key Assets:</u>
Louisiana Geological Survey
ULL School of Geosciences
The Water Institute of the Gulf
Baton Rouge Water Campus
Tulane Institute on Water Resources Law & Policy
    Federal Agencies:
    USGS Louisiana Water Science Center
    USGS National Wetland Research Center
    US Department of Agriculture – National Resources Conservation Service
    US Environmental Protection Agency – Region 6
    US Fish and Wildlife Service
    US Department of Agriculture – Agricultural Research Service
    US Army Corps of Engineers

    State Agencies:
    Louisiana Department of Natural Resources
    Louisiana Department of Environmental Quality

Louisiana Department of Agriculture and Forestry

People/Groups:

LSU Water Resources Faculty in Dept. of Civil and Environmental Engineering

Jim Chen

Zhi-Qiang Deng

FrankTsai

Clint Willson

Louisiana Water Resources Research Institute

Karen Johannesson (Tulane)

Mark Davis (Tulane)

Alex Kolker (LUMCON)

Brian Roberts (LUMCON)

Recent Successes:

Into the Blue Focus Group on Capital Area Water Resources

The Mississippi River Basin Initiative (MRBI) Watershed Water Quality Monitoring in Bayou Chene and Lacassine Bayou Project. Louisiana Department of Environmental Quality, March 1, 2012 to September 30, 2014.

NSF WSC-Category 1 Collaborative: A surface water management framework to counterbalance groundwater withdrawals in wetter regions of the U.S. (8/1/14 – 7/31/17).

Tulane NSF Water Sustainability & Climate project

DoE National Institute for Climate Change Research (Coastal Center) at Tulane

Tulane / LUMCON / UNC NSF MS River Groundwater project

3. *Coastal Resilience and Sustainable Community Planning and Engineering*

Coastal communities supporting critical infrastructure and associated economic sectors are highly susceptible to both long-term and acute environmental threats like sea level rise, coastal erosion, and hurricanes. The protection of critical coastal infrastructural assets is currently a priority for the federal government, as reflected in their recent competition for Department of Homeland Security Centers of Excellence in Critical Infrastructure Resilience, for which a consortium of Louisiana Universities applied (~$20 million). NOAA, NSF and other agencies currently are promoting similar research and training themes.

Addressing the complex environmental, social, industrial, and economic challenges in Louisiana requires a workforce possessing a diverse suite of skills and training in multiple, integrated disciplines. These include the natural and biophysical sciences; the social sciences; economics; environmental policy and law; and natural resource management. Developing an able workforce requires the establishment and growth of advanced, multidisciplinary higher education programs and adult education initiatives across the State. By investing resources towards developing and nurturing networks of innovative

research and educational programs, Louisiana would be positioned to lead by example. Areas of greatest need and opportunity include the following: comprehensive and adaptive community planning for ongoing environmental change; enhancing access to and capacity for design innovation; mechanisms to promote sustainable fisheries management; mechanisms to promote early adoption of novel design practices to protect critical coastal resources and infrastructure.

High Impact Investment Opportunities
A) Research Commercialization and Translational Activities

Commercialization opportunities could include: new technologies for sustainable and renewable energy; innovative design and architecture resilient to natural disasters (e.g. "amphibious houses"); new strategies for management of stormwater and flooding; innovative resource management approaches (e.g. fisheries cooperatives); new processes for community engagement in coastal planning; new strategies for adaptation to ongoing and future environmental change (e.g., new transportation and evacuation networks).

Specific investments to promote commercialization could include the following:

- Pilot research grants to investigators at Louisiana institutions targeted specifically for development of commercializable innovation.
- Administrative support to universities to promote partnerships with industry including capital and human resources infrastructure for outreach and engagement (e.g., the development of co-op programs);
- Support for public-private incubator centers that involve strategic co-location of public and/or private entities with university partners

B) Workforce Development
- Fund interdisciplinary academic degree programs in Coastal Community Resilience/Sustainable Community Planning or related fields that involve integration of biophysical sciences with social sciences such as anthropology, economics, public policy, and history. Both undergraduate and graduate programs should be considered.
- Support implementation of technical certificate programs and workshops for professionals, focusing on Coastal Community Resilience/Sustainable Community Planning and Engineering.
- Providing funds for faculty to train at—or collaborate with researchers at—leading institutions with concentrations of key expertise;
- Providing matching funds to incentivize targeted hiring in departments or institutions with open faculty or staff lines;
- Providing complementary support for critical instructional and research infrastructure (e.g., instrumentation, new laboratories, new buildings to house new departments or academic centers/institutes, or funds for renovation of existing infrastructure) to enable targeted hiring or to operationalize educational and/or training programs;
- Creating new faculty lines for targeted programs.

<u>Impacts</u>

Focusing on in-demand education and research topics would demonstrate a progressive approach to growing and sustaining the State's economy in areas that can lead to significant job growth, while also enriching and protecting cultural and natural resources. Job growth in the area of Coastal Resilience & Sustainable Community Planning and Engineering could involve a diverse portfolio of sectors and actors, including but not limited to: environmental consulting firms and think-tanks; environmental construction and contracting firms; sustainable and renewable energy firms; and manufacturing firms focusing on sustainable building materials.

The aforementioned recommendations would also increase recruitment and retention of highly skilled workers in the State. Several recent major studies have identified a suite of target industries for Louisiana's future economic growth that fall under the conceptual umbrella of Coastal Resilience & Sustainable Community Planning and Engineering, industries that also produce high quality jobs (average wages in 2011 for several of the targeted sectors ranged from $62,863 to $88,186) (Brookings 2010; GNOCDC 2013; GNO Inc. 2012; LAEDC 2006). Greater New Orleans, Inc. (GNO Inc.) has identified "Emerging Environmental" as a major new area of economic diversification in Louisiana, potentially "making Louisiana the 'silicon valley' of sustainable industry" (GNO Inc. 2012). A survey of 33 businesses in Louisiana that do work within this Emerging Environmental economic sector (defined by GNO Inc. as "products and services that help companies manage (and even profit from) environmental issues and challenges.") found that 73% percent of Emerging Environmental business leaders felt that there are new innovations or processes being developed in the sector, and that greater investment in coordinated education would enhance growth in the sector. GNO, Inc. (with partners The Walton Family Foundation and Mather Economics LLC) also estimated that upcoming future coastal initiatives in the Gulf Coast region, including Coastal Resilience & Sustainable Community Planning and Engineering initiatives, could,

- "Create 57,697 new jobs over 50 years;
- Add 1,549 jobs per year;
- Result in 29.54 new jobs lasting on average 4.4 years per each million dollars;
- Promote strong job growth across the transportation/utilities, government, leisure/hospitality, business services, construction, retail trade, and manufacturing sectors;
- Bring balance to the regional economy through direct and indirect employment" (GNO Inc. 2012).

Thus, investments in higher education in Coastal Resilience & Sustainable Community Planning and Engineering are necessary to create in-demand, high quality jobs that will result in significant, long-lasting economic improvement in the State.

<u>Key Assets:</u>
National Incident Management Systems and Advanced Technologies Institute
Coastal Sustainability Studio
Louisiana Sea Grant Program

LSU School of Architecture
LSU College of Art and Design
Department of Environmental Sciences
Louisiana Department of Health and Hospitals
Coastal Community Resilience Research group
Human Dimensions Program, Water Institute of the Gulf
Center for Environmental Communication, Loyola University
Disaster Resilience Leadership Academy, Tulane University
Lowlander Center
Tulane City Center
Waggoner and Ball Architects
Tulane University Riverfront Campus for Applied Coastal Sciences and Engineering

People/Groups:

Jeff Carney, LSU Coastal Sustainability Studio
Nina Lam, LSU Dept. of Environmental Sciences
Margaret Reams, LSU Dept. of Environmental Sciences
Matt Lee, LSU Dept. of Sociology
Troy Blanchard, LSU Dept. of Sociology
Tim Slack, LSU Dept. of Sociology
Michelle Meyer, LSU Dept. of Sociology
Robert Gramling, ULL Dept. of Sociology
Stephen Barnes, LSU Dept. of Economics
Dek Terrell, LSU Dept. of Economics
Craig Colten, LSU Dept. of Geography and Anthropology and Water Institute
Matthew Fannin, LSU Dept. of Ag. Economics and Agribusiness
Robert Thomas, Director, Center for Environmental Communication, Loyola University
Shirley Laska and Kristina Peterson, Lowlander Center
Michael Blum and Amy Lesen, Tulane / Xavier Center for Bioenvironmental Research
Maurice Cox, Tulane City Center

Recent Successes:

2012-2014. Stephen Barnes. Valuing Louisiana's Working Coast. (PI, with Dek Terrell), Coastal Protection and Restoration Authority of Louisiana, $757,898.

2014-16 **Lam NSN**, Reams M, Rohli R. Community resilience to drought hazard: An analysis of drought exposure, impacts, and adaptations in south-central United States. *U. S. Geological Survey*. $254,485. 09/01/2014-08/31/2016.

2014-18 Twilley R, Bentley S, Chen Q, **Lam NSN**, Xu K. 2014. DELTA SEES: Sustainability of deltaic coastlines – the trillion dollar problem. *National Science Foundation*. $1,600,000 (Total award), $1,100,000 (LSU portion). 09/01/2014-08/31/2018.

2012-16   **Lam NSN**, Liu KB, Reams MA, Rivera-Monroy V, Xu YJ. Pace K. Dismukes D. CNH: Coupled natural-human dynamics in a vulnerable coastal system. *National Science Foundation*. $1,499,935. 09/01/12-02/28/17.

LSU School of Architecture the only US school invited to participate in international student competition and research symposium entitled "Designing Resilience in Asia" hosted by National University of Singapore.

THE WATER INSITUTE OF THE GULF. Modeling Tools to Predict the Effects of Coastal Protection and Restoration Projects. 2014.

"Adaptive land and water management on the coast: From agriculture to aquaculture". Louisiana Sea Grant College Program. 2014.

Tulane NSF New Orleans ULTRA-eX project

Tulane NSF CNH project

Appendix A: Louisiana Organizations and Businesses Oriented Toward Coastal and Water Management
Related Concerns as Provided by Louisiana Sea Grant College Program

Daybrook Fisheries, LA
Office of Coastal Protection and Restoration, LA
Gulf of Mexico Alliance, AL, FL, LA, MS, TX
Gulf Oyster Industry Council, LA
Gulf Restoration Network, LA
Jefferson Parish Economic Development Commission, LA
Lafitte Commercial Fishing Museum, LA
Lake Pontchartrain Basin Foundation, LA
Louisiana Alligator Farmers and Ranchers Association
Louisiana Chapter of the American Fisheries Society
Louisiana Charter Boat Association
Louisiana Crab Task Force
Louisiana Crawfish Farmers Association
Louisiana Environmental Action Network
Louisiana Farm Bureau
Louisiana Outdoor Writers Association
Louisiana Oyster Dealers and Growers Association
Louisiana Oyster Task Force
Louisiana Restaurant Association
Louisiana Science Teachers Association
Louisiana Shrimp Association
Louisiana Wildlife Federation
Motivatit Seafoods, LA
National Audubon Society (Louisiana Coastal Initiative)
Plaquemine Oyster Association, LA
Louisiana Seafood Promotion Board
Aquaculture Systems Technologies, LLC
Blue Cross Blue Shield
British Petroleum (BP)
ConocoPhillips
Crescent City Farmers' Market
David Chauvin's Seafood Company, LLC
Fish America
Floating Islands Environmental Solutions
Gulf Coast Refrigeration
Lake Pontchartrain Fishermen's Association
Louisiana Blue Crab Task Force
Louisiana Catfish Grower's Association
Louisiana Crawfish Farmers Association
Louisiana Crawfish Promotion and Research Board
Louisiana Natural Freshwater Catfish Association

Louisiana Oyster Industry Council
Louisiana Restaurant Association
Louisiana Shrimp Association
Louisiana Shrimp Industry Coalition
Louisiana Travel Promotion Association
Marina and Boatyard Association Louisiana
Market Umbrella
Martin Ecosystems, Inc.
Mississippi Farmers Market
Oyster Dealers and Growers Association
Shaw Environmental and Infrastructure Group
Shell Oil Company
State Charter Boat Organizations
The McIlhenny Company
Tidewater (advisory council)
Trace Register, LLC
Vietnamese American Fishermen's Association
Waldemar Nelson, Inc.

Area 1: *Coastal Resilience Through Next Generation Coastal Science, Engineering, and Management*

1.A Research Initiatives

Risks to coastal regions and their ecosystems and socioeconomic systems are worldwide, but especially profound in populated coastal river deltas. This has been recently highlighted by the Department of Defense (2014) as a potential flashpoint for international security ("threat multiplier"). These risks include flooding, land loss, human health, marine transportation, and socio-economic disruption. Further, risks to coastal communities from hurricane inundation and related phenomena are a national priority area particularly on the East and Gulf Coasts, highlighted by the National Academies of Science (2014). While focused on the U.S. Army Corps of Engineers Water Resources programs, the report outlined important strategies for all coastal regions. Shoring up coastal resilience through wetlands engineering is a major opportunity for investment in Louisiana that will yield tangible economic and social returns.

1.B Existing and Prospective Strengths

Key Assets:
Baton Rouge Water Campus / River Model Facility
Louisiana Universities Marine Consortium
Tulane University Riverfront Campus for Applied Coastal Sciences and Engineering
LSU Coastal Studies Institute
LSU School of the Coast and Environment
LSU Center for Computation and Technology, and affiliated computational hubs
Academic Programs in Coastal Science and Engineering
Louisiana Department of Transportation and Development
Coastal Protection and Restoration Agency
The Water Institute of the Gulf
ULL Center for Ecology & Environmental Technology
ULL Institute for Coastal Ecology & Engineering

2.A Tech Transfer and Commercialization

- Investment in key multi-institutional facilities is critically needed. These investments will foster intellectual and economic growth in coastal/water SEM, and allow rebuilding of core academic programs.
- Academic leadership (hiring senior and rising-star researchers) including endowed chairs in this focal area is needed to provide truly innovative scholarship and expand capabilities in key fields, including but not limited to engineering risk/reliability, and geodesy/geoinformatics.

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- Academic institutions should provide innovative academic and research programs that enhance undergraduate and graduate training (quality and numbers of graduates), and basic and applied research in coastal/water SEM. This response should include high-performing institutions that presently do not house academic programs directly focused on coastal/water SEM, such as Louisiana Tech and Xavier University of New Orleans.

Graduate training in these science, engineering, and policy fields is needed.

1, 2, 3 Key Participants

People/Groups:

Endowed chair in coastal/hurricane hazards and director of LSU Hurricane Center

Tor Tornqvist (Tulane)

Kyle Straub (Tulane)

Endowed chair in geophysical sciences (Dept of Earth & Env Sciences, Tulane)

Focal Area 2: *Water Resources Management and Technology*

1.A Research Initiatives

Water resource management, sustainability, and technology are national priorities. The National Science Foundation, National Academies of Science and Environmental Protection Agency have all developed targeted funding programs in these areas. The U.S. Department of Agriculture's Natural Resources Conservation Service recently developed the "Gulf of Mexico Initiative" for supporting new technologies related to agricultural water resource management in Gulf States including Louisiana. Our universities, by promoting curricula and research priorities relevant to water resources, can ensure that students seize the opportunity to be part of the state and national awakening to the importance of meeting water resource challenges. Water resource management therefore presents a second major opportunity for economic investment and growth.

1.B Existing and Prospective Strengths

Key Assets:

Louisiana Geological Survey

ULL School of Geosciences

The Water Institute of the Gulf

Baton Rouge Water Campus

Tulane Institute on Water Resources Law & Policy

Federal Agencies:

USGS Louisiana Water Science Center

USGS National Wetland Research Center
US Department of Agriculture – National Resources Conservation Service
US Environmental Protection Agency – Region 6
US Fish and Wildlife Service
US Department of Agriculture – Agricultural Research Service
US Army Corps of Engineers

State Agencies:
Louisiana Department of Natural Resources
Louisiana Department of Environmental Quality
Louisiana Department of Agriculture and Forestry

2.A Tech Transfer and Commercialization

Research Commercialization and Translational Activities

In order to drive economic growth associated with water resources and technology, we need to encourage technological developments at the university-level that can lead to commercialization. Specific investments may include the following:

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- Research that explores opportunities to replace fresh water with brackish water in industrial and commercial processes.
- Agricultural technologies for water re-use and low-water crop production.

3.A Workforce Development

In order to drive economic growth associated with water resources and technology, we need to expand the workforce of highly-skilled people in related STEM fields, including strengthening of multi-disciplinary programs and coordination among universities. Specific investments may include the following:

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- Encourage linkages among academic programs and industry partners in the area of water resources management and technology. These linkages could be made, for example, through

funding of internship arrangements, through faculty training programs, or through investments in research.

- Encourage the inclusion of water resource subject matter in courses taught primarily for future K-12 teachers and promote its use in their classrooms.
- Provide new funding opportunities for fundamental and applied research related to water resources management and technology.
- Enhance coordination and cooperation of water resources teaching and research activities throughout the state. For example, a state-wide water research coordination network and/or annual workshops that target water resources work.

1, 2, 3 Key Participants

People/Groups:
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Focal Area 3: *Coastal Resilience and Sustainable Community Planning and Engineering*

1.A Research Initiatives

Coastal communities supporting critical infrastructure and associated economic sectors are highly susceptible to both long-term and acute environmental threats like sea level rise, coastal erosion, and hurricanes. The protection of critical coastal infrastructural assets is currently a priority for the federal government, as reflected in their recent competition for Department of Homeland Security Centers of Excellence in Critical Infrastructure Resilience, for which a consortium of Louisiana Universities applied (~$20 million). NOAA, NSF and other agencies currently are promoting similar research and training themes.

Addressing the complex environmental, social, industrial, and economic challenges in Louisiana requires a workforce possessing a diverse suite of skills and training in multiple, integrated disciplines. These include the natural and biophysical sciences; the social sciences; economics; environmental policy and law; and natural resource management. Developing an able workforce requires the establishment and growth of advanced, multidisciplinary higher education programs and adult education initiatives

across the State. By investing resources towards developing and nurturing networks of innovative research and educational programs, Louisiana would be positioned to lead by example. Areas of greatest need and opportunity include the following: comprehensive and adaptive community planning for ongoing environmental change; enhancing access to and capacity for design innovation; mechanisms to promote sustainable fisheries management; mechanisms to promote early adoption of novel design practices to protect critical coastal resources and infrastructure.

1.B Existing and Prospective Strengths

<u>Key Assets:</u>
National Incident Management Systems and Advanced Technologies Institute
Coastal Sustainability Studio
Louisiana Sea Grant Program
LSU School of Architecture
LSU College of Art and Design
Department of Environmental Sciences
Louisiana Department of Health and Hospitals
Coastal Community Resilience Research group
Human Dimensions Program, Water Institute of the Gulf
Center for Environmental Communication, Loyola University
Disaster Resilience Leadership Academy, Tulane University
Lowlander Center
Tulane City Center
Waggoner and Ball Architects
Tulane University Riverfront Campus for Applied Coastal Sciences and Engineering

2.A Tech Transfer and Commercialization

- Pilot research grants to investigators at Louisiana institutions targeted specifically for development of commercializable innovation.
- Administrative support to universities to promote partnerships with industry including capital and human resources infrastructure for outreach and engagement (e.g., the development of co-op programs);
- Support for public-private incubator centers that involve strategic co-location of public and/or private entities with university partners

3.A Workforce Development

- Fund interdisciplinary academic degree programs in Coastal Community Resilience/Sustainable Community Planning or related fields that involve integration of biophysical sciences with social sciences such as anthropology, economics, public policy, and history. Both undergraduate and graduate programs should be considered.

- Support implementation of technical certificate programs and workshops for professionals, focusing on Coastal Community Resilience/Sustainable Community Planning and Engineering.
- Providing funds for faculty to train at—or collaborate with researchers at—leading institutions with concentrations of key expertise;
- Providing matching funds to incentivize targeted hiring in departments or institutions with open faculty or staff lines;
- Providing complementary support for critical instructional and research infrastructure (e.g., instrumentation, new laboratories, new buildings to house new departments or academic centers/institutes, or funds for renovation of existing infrastructure) to enable targeted hiring or to operationalize educational and/or training programs;
- Creating new faculty lines for targeted programs.

1, 2, 3 Key Participants

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