



THE LOUISIANA WATER ECONOMY

**OUR SHARED
DESTINY**

**Findings & Recommendations for the
Greater New Orleans Region**

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“Louisiana is at a crossroads. We’ve been pretty much of a laissez faire kind of state insofar as we use water. It’s been abundant, and we haven’t thought about it very much at all. But there are coming changes and coming demands on our water resources that threaten to blindsides us if we don’t anticipate them and put in place some system where we can manage our water so that competing uses can be in existence at the same time.”

James Wilkins, LA Sea Grant, Louisiana Public Square, Louisiana Public Broadcasting, July 2012

Volume 1, Issue 1 of *The Louisiana Water Economy: Our Shared Destiny* was researched and prepared by Adaptation Strategies. The statements, findings, conclusions, and recommendations are those of the authors, and do not necessarily represent the views of the Greater New Orleans Foundation, the Neighborhood Partnership Network, or the organizations, institutions, reviewers, or interview subjects named in this report.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	IV
INTRODUCTION	1
DEFINING A WATER ECONOMY	3
<i>Defining the Louisiana water economy</i>	3
FINDINGS	6
<i>Additional Findings</i>	8
RECOMMENDATIONS	14
SCOPE, METHODS, AND LIMITATIONS	17
AUTHORS' NOTE	18
ACKNOWLEDGMENTS	20
ABOUT THE AUTHORS	21
CITATIONS	22
APPENDIX	27
INTERVIEWS	27
<i>Goals & Recommendations of Recent Regional Studies</i>	28
<i>Regional Water Clusters</i>	29

EXECUTIVE SUMMARY

The goal of this series of reports is to provide a guide for the investment of time, money, and resources to build a regional water economy. The study region encompasses the parishes of Assumption, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Tammany, Tangipahoa, Terrebonne, and Washington. This research began with two questions:

- *What are the water-related assets of the thirteen-parish region served by the Greater New Orleans Foundation?*
- *How can investment help align those assets to build a water economy?*

Water is as essential to the economy as it is to life, yet there is no globally accepted definition of the phrase “water economy.” In this report, we define “Louisiana water economy” to mean all economic and social activities in which water is an important and/or dominant factor, and in which Louisiana’s relative water “wealth” and abundance—whether for “good,” or as is the case with costly surge, flood, and disaster management, for “bad”—contributes to the existence of the sector, resource, or activity.

In *Louisiana’s Water Innovation Cluster: Is it ready for global competition?*, we identified economic sectors where water is an important and/or dominant factor [1]. Based on spending levels, available data on economic impact, and knowledge of plans and programs, the following seven sectors emerged:

1. Agriculture and fisheries (AF)
2. Coastal and environmental management and restoration, including surge and flood protection systems, disaster management, resilience planning (CE)
3. Ecological and cultural recreation and tourism (ET)
4. Industry, energy, and manufacturing (IM)
5. Maritime, ports, and navigation (MP)
6. Municipal sewer, water, and drainage infrastructure (MI)
7. Law and policy (LP)

Louisiana’s water economy potential is based on existing water strengths and assets that connect the seven sectors. However, a significant challenge is that responsibilities for water are fragmented among hundreds of federal, state, and local entities, and a comprehensive water authority or leader has yet to emerge to align assets and develop a shared vision.

This report identifies three top-level findings:



Ten more findings and sixteen recommendations represent the core of this paper, which is designed to convey actions the authors believe are attainable within the constraints of the rapidly changing, dynamic socioeconomic realities of Louisiana in 2017. This study is the first of a series of reports on Louisiana's water economy, its components, and its potential.

In Louisiana, it remains nobody's job to have a comprehensive understanding of water. Gathering data, compiling information, delivering findings and recommendations, and making plans all depend upon investment. Building our water economy requires that we make this work the priority of an organization with a multidisciplinary team that reflects and connects the seven sectors as "one water" and Louisiana's greatest natural asset [2].

This report recognizes that the power of water controls our future. With this study we move closer to understanding the potential of Louisiana's water economy, and the need to align strategic investment and actions by all sectors and actors. As we strive to build a water economy that works wisely with water rather than against it, we adapt and move into a new economic era. The question is: *can we move faster?*

INTRODUCTION



This series of reports represents thousands of hours of research into defining—and building—a Louisiana water economy. It is based on a premise that Louisiana's unique combination of land, water, and people are the primary assets driving our wellbeing and economy.

In researching this subject, we gained insights from Harvard professor Michael E. Porter, whose current research and writings emphasize that regions must focus on existing strengths, rather than elusive, non-existent attributes or goals. Porter rejects methods such as market-skewing financial subsidies, decries emphasis on the recruitment approach he calls “big game hunting,” and eschews the investment of public dollars in “build it and they will come” facilities [3]. True competitiveness, he argues, depends upon identifying and developing existing assets. Our approach reflects Porter's work, and recognizes that water defines our future.

Water is both friend and foe, depending on how its quantity and quality impact human activities; but its abundance represents a vital asset upon which all activities, both human and ecological, depend.

Water is fundamental to what it means to be Louisiana. From our iconic seafood, music, and cultural fabric, to our industries and our history of floods and storms, water is the essential resource that defines us and determines whether we thrive or suffer. Few places on the planet are blessed with such a productive mix of natural and social assets, and it is up to us to develop a vision for what it means to live well in this special place. To begin, we must define what a water economy is. This report takes an important step in that direction.

In our research to define a Louisiana water economy, we identify seven economic sectors where water is a dominant factor. We then frame assets and actions that fit within our definition. In mapping these assets we seek to support and unite a “one water” framework from which business leaders and decision-makers can guide investments to effectively grow the water economy [2, 4].

Much like the phrase “water economy,” the word “assets” has many meanings. For Louisiana's water economy, assets range across a mix of environmental and social resources. At the highest level are the natural assets and ecosystem services without which we and all our activities cannot exist. Ecosystem services, also called “natural capital,” includes air, water, land, minerals, plants, animals, and all aspects of the environment upon which human activities and commerce depend. In 2010 a study by Earth Economics determined the value of the ecosystem

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services of the Mississippi Delta as annually worth between \$12 billion and \$47 billion, representing an asset value of between \$300 billion and \$1.2 trillion [5].

Louisiana's damaged watersheds and ecosystems remain productive, but the natural capital fueling our economy and lifestyles is deteriorating. A growing number of economic, environmental and social measures reveal a state in decline [6-8]. The same is true for measures of planetary health [9]. Thus our success in building a water economy depends upon rebalancing our relationship with natural systems.

Louisiana's seven water sectors represent a cluster of clusters across nearly every economic and social activity. Many components of these sectors are mature clusters focused on specific products, services and resources, and some are emerging and unmapped. Within each sector are myriad opportunities to implement **circular economy** principles of efficiency and innovation, contributing to an abundance of potential entrepreneurial ideas, products, and services that guide actors and activities to be more regenerative, sustainable, equitable, and profitable.

Water is in many ways a poster child for circularity. For the last 3.8 billion years, the earth's stock of water, a constant 1.4 billion km³, has continuously circulated through the many stages and processes of the hydrological cycle, powered by the energy of the sun. In the last hundred or so years, a blink of an eye in planetary time, human activities have started to disrupt this well-tuned circularity in ways that risk our future prosperity as well as the health of the planet.

Applying the Circular Economy Lens to Water, Nick Jeffries, Circulate News, Jan. 2017

The circular economy is a global movement to transform the linear "take-make-dispose" economic model into a restorative system that reduces demands on natural resources, extracts the maximum value and utility from them while in use, then recovers, regenerates, and/or repurposes products at the end of their service life. The water cycle is globally recognized as the best example of circularity [10-13].

Water always prevails. And one thing we know with certainty, we cannot afford to continue doing what we've done. Because—for better *and* for worse—water is our future.

DEFINING A WATER ECONOMY

Water is necessary for life and for economic activities. It is a core resource for diverse industries where it may be everything from an ingredient to a conveyance. Water dilutes, washes, dissolves and catalyzes myriad processes upon which people depend for their lives and livelihoods. Measuring its roles and economic impacts is complex and daunting, and only fairly recently have there been any attempts to quantify the value of water globally [14].

There is no generally accepted definition of the phrase “water economy.” The term is frequently used by economic development promoters both nationally and internationally, but it means different things in different locales. A water economy to a dry state or country may mean technologies that improve efficiency or desalinate salt water into fresh; to a wet region it may mean flood management, agriculture or industrial development. The water economy of Pittsburgh, Pennsylvania is very different from the water economy of Riyadh, Saudi Arabia.

Though many seek to analyze markets and tap into water as an economic strategy, the diversity of water’s roles, the variations in its availability and quality, and its ubiquitousness as a necessity have yet to be comprehensively analyzed and measured to define the meaning of a “water economy” [15-19].

The definition of “water market” also lacks clarity. Water analyst Steve Maxwell once described “a sprawling conglomeration of many, fundamentally quite different businesses” when attempting to define water markets [18]. The variability of the roles of water, and the differences produced by its relative quantity and quality affect how its economic roles are perceived and measured.

Additionally, Mark Davis, Director of the Tulane Institute for Water Resources Law and Policy, asserts that a way to view the water economy is in terms of investments or expenditures related to water use or stewardship driven by two fundamentals of economics, market activities (use and demand) and societal mandate (laws and regulations) [20].

Defining the Louisiana water economy

We define the phrase “Louisiana water economy” to mean all economic and social activities in which water is an important and/or dominant factor, and in which Louisiana’s relative water “wealth” and abundance—whether for “good,” or as is the case with costly surge, flood, and disaster management, for “bad”—contributes to the existence of the sector, resource, or activity.

What are the assets upon which the regional water economy is built?

In the thirteen parish study region of Assumption, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Tammany, Tangipahoa, Terrebonne, and Washington, abundant natural resources support a complex mix of assets. At the nexus of these assets are systems engineered to protect communities and infrastructure, but which also undermine the forces that built the land and provided natural protections from storms and tides. This mix of assets, resources, systems, and challenges represents the core of economic activities in the region.

In *Louisiana's Water Innovation Cluster: Is it ready for global competition?* we identified seven socioeconomic sectors dependent upon the state's mix of water-related natural, economic, and human resources [1]. The seven sectors build upon and complement previous studies dating back to 2001 and represent the state's economic water assets [21].



The seven sectors are:

- Agriculture and fisheries (AF)
- Coastal and environmental management and restoration, including surge and flood protection systems, disaster management, resilience planning (CE)
- Ecological and cultural recreation and tourism (ET)
- Industry, energy, and manufacturing (IM)
- Maritime, ports, and navigation (MP)
- Municipal sewer, water, and drainage infrastructure (MI)
- Law and policy (LP)

Louisiana is well-positioned to define and build a strong, resilient, diversified, equitable economy based on existing water strengths and assets that connect across the seven sectors. Investment opportunities will be found in circular economy strategies that comprehensively align the sectors, and by focusing on watershed-oriented, integrated water management as key to the overall economic wellbeing of Louisiana [22, 23].

Integrated water management (also called Integrated Water Resource Management) is described as “a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems” [24]. This principle is exemplified in the Greater New Orleans Urban Water Plan [25].

For many—if not most—business and municipal uses in Louisiana, water is freely taken from ground or surface sources [26]. Since water has been “free,” (perceived to be much like air), attempts to value water—and to charge for its use—are fraught with conflict and confusion. Another challenge in integrating water assets and potential is that responsibilities for Louisiana’s water resources are fragmented across hundreds of federal, state, and local entities; and though many water-related organizations and institutes exist, a comprehensive water authority or leader has yet to emerge. As state and regional economic development and academic institutions increase their emphasis on water, the need—and opportunity—for leadership grows [27-29].

If there is a sector in which use of the phrase “leadership” is appropriate, it is the Coastal and Environmental (CE) management and restoration sector (which includes surge and flood protection systems, disaster management, and resilience planning). Louisiana’s Coastal Master Plan positions the state as a leader. And the CE sector is evolving into a “brand” opportunity for the region and state, with a growing body of research in support of optimizing the socioeconomic impact and infrastructure realities of CE spending and activities [30-35]. Additionally, major flood and surge management systems are potential visitor attractions, providing an opportunity to build awareness of the scale and importance of these structures.

An emerging asset is the investment of philanthropy and government in resilience. New Orleans won a National Disaster Resilience Competition (NDRC) grant to implement and install green infrastructure, and the Biloxi-Chitimacha-Choctaw tribe won a NDRC grant for the relocation of the residents of Isle de Jean Charles. Both have been the subject of a growing body of press coverage and will be a source of future water “branding” expected to strengthen regional expertise and awareness of Louisiana’s water economy. Additionally, the related rise of green infrastructure approaches as fundamental to municipal codes and urban development represents another developing opportunity to more broadly engage both residents and visitors [36, 37].

Louisiana’s historical strengths in maritime and ports, its robust tourism industry, its emerging roles in water law and policy, and the state’s reputation and market position in fisheries, agriculture, and academic research also represent underutilized assets upon which our water economy brand may be extended. Subsequent reports in this series will dive more deeply into each sector.

"Economically and legally water is the child of a thousand parents, and is essentially orphaned."

Mark Davis, 2011

FINDINGS

Our research identified three top-level findings:

1. Vision

The thirteen parish study area lacks a common, comprehensive vision to realize the region's water economy potential.

Louisiana—and our water economy—requires a vision for what it means to have a healthy, productive, thriving state.

Vision is framed by the question “what does success look like?” Without a common vision, it is impossible to develop an effective mission and subsequent goals and objectives. This lies at the heart of many challenges in Louisiana—we don't know what success looks like because few people are asking the question. Instead we continue to expend limited resources, seemingly trapped in a reactive rather than proactive manner.

Parish boundaries and government policies complicate water management, and often fail to recognize what Sewerage and Water Board of New Orleans Deputy Director Bob Miller calls the “shared destiny” of neighboring parishes.

Watersheds of the study region cross many parish boundaries; and watershed-oriented planning is crucial to effective economic development. The more parish water planners and managers connect to broader watershed wellbeing, the more likely they may be to work together to share and collaborate. The challenge is not only to develop supportive institutional resources, but to identify key collaborators to build strategies united by a vision. The leadership potential of urban areas is also key to implementing improved water standards in nearby rural areas [18].

2. Leadership

Strong, systems-wide, private sector leadership is needed to guide and build Louisiana's water economy

Private sector leadership is vital to building a regional water economy.

Leadership is not a job but a calling; it is about framing and seizing the moment. In certain sectors Louisiana exhibits leadership because land loss, sea level rise, hurricanes and floods compel us to. The findings in this report represent significant opportunities for leadership.

In *Louisiana's Water Innovation Cluster: Is it ready for global competition?*, we examined the phenomenon of the rise of water technology innovation clusters designed to provide a framework for collaboration, coordination, and communication that accelerates the adoption and commercialization of new technologies around diverse water issues [1].

The major common factor in the formation of today's water clusters is influential leadership that recognizes the breadth and depth of the resource, cultivates collaboration, and builds the capacity of education, government, and community resources to accelerate progress [1].

Louisiana's water sectors represent a cluster of clusters, and though there are leaders in specific sectors there remains a need to identify, to nurture, and to coordinate leaders and investments to build a cooperative, cross-sector support model (or models) to develop the region's (and state's) water economy. In the study region, economic development organizations (EDOs) and nongovernmental organizations (NGOs) are working collaboratively on water cluster initiatives [34, 38, 39]. However private sector leadership is yet to emerge, support, and guide these efforts.



A defining leader in Milwaukee: Rich Meeusen of Badger Meter

In 2009 a group of Milwaukee business leaders founded the Water Council with a mission to establish the region as a global center of water innovation. Rich Meeusen of Badger Meter and Paul Jones of A.O. Smith (the world's largest hot water tank manufacturer) helped establish the Milwaukee 7 regional economic development organization in 2005. In 2009 they co-founded the Water Council and the Global Water Center. Meeusen is a passionate, outspoken, and driven CEO whose enthusiasm and actions are key to the growth and success of Milwaukee in building its water economy assets [40, 41].

3. Metrics

Water, including its social and environmental impacts, is inadequately and inconsistently measured, aligned, leveraged, and monitored.

Inconsistency in how, why, and what we measure hampers socioeconomic progress, and undermines environmental systems.

The old adage, "you can't manage what you don't measure," epitomizes the challenges faced in understanding and managing water. Efforts to measure the amount of water taken from surface and groundwater sources to determine Louisiana's "water budget" are recent and limited in scope [42].

With regards to how public and private sectors manage resources, numerous globally accepted systems exist to guide measurement and monitoring of resources, including water; few are used in the region. Innovation opportunities exist in water management measures, tools, data, and techniques; a reality that builds upon ongoing philanthropic and governmental investment in research, education, and entrepreneurship [43].

With its inclusion in the first round of Rockefeller 100 Resilient Cities, New Orleans began a process that is leading to better climate and social impact reporting [44]. However, state, parish, and municipal plans lack connection to international carbon, water, and social reporting methods.

Several widely accepted tools exist for communities (and organizations) to report and to measure greenhouse gas emissions (carbon footprint), water, and resource demands [45, 46]. Many cities developed sustainability plans years ago to set goals to reduce waste and improve efficiencies to address managing and reducing climate impacts. Similar plans are lacking in the study area. The existence of such plans reflects positively on communities and parishes, and are part of a strong economic development toolkit [47, 48]. Prospective residents and businesses seek to locate in places where smart planning connects quality of life to resilience and global standards of sustainability and wellbeing. The lack of sustainability, carbon-, and water-footprint plans and reports in the region represents an opportunity for investment .

Additional Findings

4. No organization comprehensively manages water.

No organization or role is responsible for comprehensively managing water knowledge and data across all sectors or for developing a statewide economic development strategy specifically for water in Louisiana.

Programs, agencies, EDOs, and NGOs address many significant water issues, but none of these actors is tasked with developing the systems and networks needed to connect across all seven sectors to build a Louisiana water economy.

5. Government management systems are fragmented, resulting in diluted and inconsistent authority.

Fragmentation of authority is a major factor contributing to inconsistencies and challenges in the management, regulation, and sustainable utilization of water. Myriad federal, state, and local agencies have authority and/or responsibilities over water.

Aligning diverse government agencies, policies, and programs is perhaps the most obvious and challenging aspect of building a water economy. Drinking water systems are regulated and permitted by the Louisiana Department of Health (DOH) and wastewater systems by the state's Department of Environmental Quality (DEQ). In some cases, four state agencies may impact a water system. In many situations, there is no

authority unless a problem arises. Across Louisiana, more than 700 federal, state, and local entities have some sort of authority over water [49].

Louisiana state agencies and academic resources can be perplexing when trying to determine which agency has a logical role as part of a sector. Other state agencies with water responsibilities include: the Departments of: Culture, Recreation, and Tourism (CRT); Natural Resources (DNR); Agriculture and Forestry (DAF); Wildlife and Fisheries (DWF); Transportation and Development (DOTD); the Coastal Protection and Restoration Authority (CPRA); the Water Resources Commission; Louisiana Economic Development (LED); LSU AgCenter and Louisiana Sea Grant; and the Public Service Commission (PSC) which regulates rates of certain water utilities. Many of these agencies conduct public outreach and provide educational and business support; but there is no unifying vision, or any organization monitoring or connecting these activities.

6. Aging infrastructure poses a significant threat to water security.

Aging infrastructure managed by an aging workforce are global issues that impact water security [50]. "Water security" was defined in 2013 by a United Nations task force as the "capacity of a population to safeguard sustainable access to adequate quantities of and acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability." [51] Poorly maintained water and petrochemical infrastructure represent significant threats to water quality and security, and could cause sudden—and expensive—disruption of human activities.

In the region, aging infrastructure includes tens of thousands of miles of petrochemical pipelines both on land and in water, thousands of oil wells, and dozens of refineries and manufacturing facilities [52].

Infrastructure located in sensitive estuaries and waters are at risk due to multiple factors, including subsidence, sea level rise, and the decline in the price of oil, which results in fewer companies maintaining and monitoring pipelines and wellheads. State budget cuts reduced monitoring of older wellheads on land and water, as well as the monitoring of groundwater [53, 54]. These factors are a recipe for future water and environmental contamination.

Hundreds of residential water wells and tens of thousands of onsite wastewater treatment systems exist in the study area. These wells and systems, highly concentrated in rural parishes, are poorly regulated and inconsistently monitored [55, 56]. Thousands of these systems were damaged by the 2016 floods. In many cases wells and septic systems are located on the same residential lot. Poorly monitored and maintained, these wells and wastewater systems represent a potential health and water quality crisis [57]. Louisiana's residential building codes allow developers to build up to 124 homes before requiring large-scale wastewater treatment. As a result, more than 322,000 onsite wastewater systems are in place statewide, with nearly 90,000 in the study region, representing a poorly monitored and measured potential public health threat [57].

7. Opportunities exist in leveraging excess capacities and underutilized resources.

The sharing economy is based on excess capacity and underutilized resources, and provides a lens for analyzing public and private operations to improve efficiencies. Regional utilities, educational institutions, government agencies, NGOs, and industries have diverse underutilized capacities and resources ranging from physical assets such as laboratories or hardware, to technology and expertise.

For example, multiple agencies and organizations monitor water quality and quantity, often driven by regulatory requirements. These monitoring activities and the data they collect are not aligned and rarely shared [55, 56]. The rise of “big data” analytical capacities offers the potential to identify excess capacities across a wide range of water-related resources and activities. Additionally, as sensor technologies and artificial intelligence tools improve, circular economy opportunities tailored to regional socioeconomic and environmental needs emerge.

8. Tourism is an underutilized asset.

In 2015, 28.9 million tourists visited Louisiana, drawn to experience our unique mix of cultural and natural resources [58].

Tourism in the study region is underutilized as a tool for education, and for building support for Louisiana's environmental and cultural challenges. The state and region's primary tourism agencies are not oriented to connecting visitors to urgent issues vital to the longterm survival and wellbeing of the region.

Generally, tourism themes and messages are developed based on what focus groups and market research indicate are well-received or retained slogans and/or assets. Market research methods (focus groups, surveys, etc.) have the potential to be applied to crafting messages that build support for the state's existential dilemmas while strengthening and aligning nascent ecotourism assets and businesses.

Globally, ecotourism is a significant phenomenon, and in the region includes a range of activities such as swamp tours and fishing; but the state lacks an ecotourism trade organization to affiliate with international ecotourism standards and practices [59, 60].

As one of the nation's top convention destinations, New Orleans hosts many significant water-related conferences and seminars that include prominent thought leaders and the latest developments and technologies [61]. Water-related conferences and seminars held in Louisiana represent an opportunity to connect to important networks and resources. These gatherings represent an underutilized resource for messaging and support for the state's water economy, while connecting the region to global expertise and best practices.

The region's opportunity to redefine the meaning of tourism (and the type of tourist) includes the appeal of seeing and learning about flood protection systems, and coastal adaptation and restoration projects. These investments have potential to attract a range of visitors, from casual tourists to educators, engineers, scientists, and

other professionals seeking to address global climate challenges. Attractions, such as the South Louisiana Wetlands Discovery Center, the Louisiana Nature Center at Bayou Sauvage, and many others, showcase Louisiana's natural resources and challenges, serving as models for education and tourism. Aligning and leveraging these assets is necessary, and achievable.

Tourism as key to the growth of small businesses

Nationally, small businesses and startups create the majority of jobs [62]. In the study region most of the businesses in the tourism sector are small businesses [63, 64]. Compared to highly regulated water sectors such as municipal infrastructure, entrepreneurs and innovators in the tourism sector face a low barrier to entry, a relatively modest regulatory environment, and diverse economic development resources able to help accelerate business growth.

Agritourism, birding, hunting, and fisheries-based tourism, a nascent asset

In 2008, the Louisiana Legislature passed the Agritourism Limited Liability Law (R.S. 9:2795.5) to support and help grow the nascent field of agritourism. The LSU AgCenter developed a website to connect visitors with farmers, however, budget cuts impacted this initiative [65]. Recent efforts by Sea Grant and regional organizations to encourage fisheries-based ecotourism are ongoing. In St. Bernard Parish, the Working on the Water program stages workshops and events to connect fisheries professionals to supportive government and NGO resources and to each other to share challenges and ideas. Though the state addressed liability with the Agritourism Limited Liability law, insurance is expensive and often difficult to obtain locally, a significant impediment to the growth of this resource.



9. Philanthropy needs alignment to leverage investments in support of the water economy.

State and local budgets are severely constrained, and the role of philanthropy is increasingly key to funding and leveraging multidisciplinary research and activities necessary to build the water economy. However, funders lack a connecting, water-centric vision, endeavor, or program designed to align and optimize investment.

Fragmentation undermines many of the agencies with responsibility for water, but it is also an issue with regards to funding. In the 2013 Rockefeller-funded study, *Accelerating the Development of Sustainable Water Management in the U.S.*, the first recommendation is to “Build a coalition of funders who support the development of a long-term (5-10 years) strategic plan for building the sustainable water field” [18].

Despite its modest size and population, Louisiana has a long history of regionalism, manifested as competition between cities, between urban and rural areas, and between northern and southern parts of the state. Recent cooperation on the New Orleans to Baton Rouge “super region” represents an important step toward common mission and shared destiny, but the process is yet to achieve stability across a wide range of needs and activities [31, 34].

10. *Most of the available funding for major restoration and infrastructure projects in Louisiana is the result of prior disasters.*

Our responses to the threats of water entail the expenditure of billions of dollars, as does our response to aging infrastructure. We have a substantial water economy when measured by those billions spent and planned.

Challenges remain to strengthen community support for funding flood protection, coastal restoration, resilience measures, insurance and migration issues, and for financial models that rely less on external, one-time infusions of funding.

Billions of dollars are anticipated to be spent on the state's Coastal Master Plan (CMP), and the majority of currently available funds are due to the BP Oil Spill, a profound environmental disaster caused by an industry that itself is going through one of the worst downturns in its history [66]. Additional billions remain allocated for other post-disaster infrastructure repairs [67].

Local funding sources, due to ongoing state budget issues which cascade through vital systems, are inconsistently applied and mostly elusive, as are mechanisms to engage willing communities to participate more directly in the many jobs and roles of coastal restoration programming and implementation [68, 69]. The economic and social impacts of the loss of small and large businesses, and of more than ten thousand jobs in the oil and gas sector in Louisiana, adds to the mix of dilemmas [70].

11. *Education resources are not aligned.*

Education, with a focus on environmental and water literacy, is critical to building a resilient water economy. However, Louisiana's historically low ranking in educational attainment, and the state's massive disinvestment in higher education hinders progress.

Across the seven sectors are a range of diverse needs for education and training. Investments in programs and content are not aligned in support of a common vision, or set of key principles and actions needed to holistically address water systems, opportunities, and challenges.

12. Diversity efforts and equity strategies are in early stages.

Recent economic development and resilience plans focus on equity as a strategy, and efforts to educate and train future workers to fill vacancies created by an aging workforce are in relatively early stages [37, 71]. Poverty and incarceration rates remain high [72].

Participants in regional water meetings, conferences and special events are predominantly white, and generally do not represent the racial demographics of the region. Key to future success is to increase efforts for diversity, equity, and access that more effectively connect water opportunities across cultures, sex, and class. Recognizing regional cultural diversity as an asset will help Louisiana move the dial on poverty rates, educational attainment, crime, and other equity and diversity metrics [73].

In the study area, many rural locations lack access to broadband internet and to transportation, creating an impediment to water jobs, particularly in coastal restoration [74]. Another challenge is to connect training programs to potential participants. Corporate and philanthropic support and investment is critical to these programs.

13. Many communities are not participating in the National Flood Insurance Program's (NFIP) Community Rating System (CRS).

The NFIP's CRS program helps communities lower flood insurance rates, keeping dollars in the pockets of families and local economies [68].

The cost of living in coastal zones includes the need to maintain increasingly expensive flood insurance. The National Flood Insurance Program's Community Rating System provides a set of guidelines that help communities lower flood insurance rates, but many communities are not actively participating in the CRS. This fact was identified in the recent Center for Planning Excellence *View from the Coast* report, and represents an opportunity to share resources among parishes and communities in a common mission to build resilience [68].

The floods of March and August 2016 add a sense of urgency to the need to expand investment in education regarding flood awareness, insurance, language, policies, planning, and management. A major factor impeding recovery from the 2016 floods is that more than eighty percent of the homes impacted lacked flood insurance at an estimated cost to the economy of \$10 billion [75].

RECOMMENDATIONS

The capacities of the region to address ongoing threats, disasters, and opportunities are limited. Many of the following recommendations require nothing more than determination and cooperation; others require investment in planning and implementation. Each connects to the ongoing need to more effectively engage all economic and social sectors in building a shared vision.

R1: Invest in an inclusive and transparent process to create a vision for a safe, healthy, thriving region centered on the power of integrated water management across all seven economic sectors.

R2: Identify and convene diverse leadership from each sector to explore organizational frameworks needed to catalyze, promote and develop the water economy.

R3: Invest in regional community and parish capacity to participate in developing resource measurement plans and metrics that align with globally accepted standards.

R4: Create a philanthropic water funders council or network to develop a common vision, and to identify, align, and leverage regional, statewide, national, and global philanthropic, business, and government investments.

R5: Map watersheds to the neighborhood level to provide systemic guidance for community land use planning, and to encourage residents to actively participate in restorative landscaping, water management, and the water economy.

R6: Invest in developing and implementing policy to increase the use of native plants in public projects as a key stimulant to business development, education, and resilience.

R7: Investment is needed to plan and develop systems to capture, connect, share, and leverage water-related data.

R8: Expand and implement cross-agency and cross-parish cooperative agreements and directives to guide and optimize measurement and performance of public sector activities.

R9: Invest in education and awareness of aging infrastructure, to encourage monitoring, maintenance, and data sharing, and to stimulate potential circular economy innovation in cost-savings, efficiency, health, and safety.

R10: To improve effectiveness and efficiency of outreach spending on the delivery of environmental and water education/literacy programs, invest in the capacity of the Louisiana Environmental Education Commission to develop and consolidate myriad water and ecological guides, educational materials, and messages into a set of community toolkits.

The Louisiana Environmental Education Commission's (LEEC) mission is “To create a comprehensive and balanced environmental education initiative that will result in environmentally literate citizens who will effectively and constructively solve existing environmental problems, prevent new ones, and maintain a sustainable environment for future generations” [76]. With the right mix of plans, cross-agency cooperation, and investment, LEEC is a logical organization to lead an effort to consolidate and refine a mix of educational tools to improve the efficiency of water and environmental outreach and education. Many agency materials and resources are underutilized, and efforts to reduce duplication and align messaging can lead to positive outcomes for more than just environmental education.

R11: Invest in planning and developing Louisiana Water Learning Centers at libraries throughout the region (and state) to serve as portals for regional water knowledge and opportunities, locations for community water meetings, and as partners in fostering environmental literacy, innovation, and entrepreneurship.

An important partner in building an educated and water literate populace is the state's system of libraries. Because Louisiana lacks a publicly accessible, comprehensive water organization, the challenge of learning about and acting upon regional water issues and opportunities is formidable. A solution is to create Louisiana Water Learning Centers (LWLC) within libraries. Each LWLC would be a repository and source of local water resources and knowledge. Many libraries feature meeting rooms and technology to facilitate building community capacity needed to participate in the water economy. LWLCs could serve as nodes of a statewide network, creating a system for sharing knowledge and resources, and providing an all-ages, equitable setting for nurturing community innovation and entrepreneurial activities.

R12: Identify or develop a university-based program or institute to serve as an academic catalyst to explore, develop, monitor, and promote water programs, courses, news, events, conferences, and developments. Consider an applied research center combined with a booster model similar to the New Orleans Sports Foundation.

R13: To build participation of the tourism industry as a partner in Louisiana's water economy, invest in developing Louisiana water-related surveys, language, and messages to be tested by tourism agencies as part of their regular research.

R14: Invest in building capacity to develop birding resources, guides, and networks to build upon the state's globally significant location on the Mississippi Flyway, and to connect birders to the state's coastal and water issues.

R15: Increase investment in efforts to reach people of color, youth, seniors, and women to participate in water education, planning, and training.



The Prosperity NOLA plan calls equity an economic strategy [71]. To build a regional water economy, a social and economic strategy must be broadly implemented across all seven sectors. A stronger focus on recruiting women and minorities is needed to challenge and transform status quo leadership and to expand regional cooperation and inclusion.

R16: Invest in helping communities achieve maximum participation in the National Flood Insurance Program Community Rating System to improve community resilience.

SCOPE, METHODS, AND LIMITATIONS



This report focuses on understanding and aligning the water-related assets of a thirteen-parish region. Those parishes are: Assumption, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Tammany, Tangipahoa, Terrebonne, and Washington.

Principle research occurred between June 2015 and June 2016. August 2016 floods and the presidential election are referenced but not analyzed.

We studied business, academic, and public activities across the seven sectors in each of the thirteen parishes. We also studied larger market drivers, and issues ranging from local to global. We did not deeply research the activities of NGOs, nonprofits, and advocacy organizations, though they represent powerful and vital water economy assets in the study region.

In examining the water assets of the study region, we began with a key set of questions framed by the acronym **STAUL-R**[®], which asks who is: **S**pending, **T**raining, **A**dvocating, **U**sing, and **L**eading, and what natural and social **R**esources support the activity.

In reviewing data, we used traditional SWOT analyses (strengths, weaknesses, opportunities, threats). We also applied many of Michael Porter's cluster principles to examine supply, labor, and other relationships [3]. Because of the diversity of data, and myriad cross-sectoral phenomena and activities, information about each sector regarding spending and jobs sometimes produced significant overlap. Due to a lack of reliable economic data in the nascent water economy field, and to myriad dynamics in the political and business environments of Louisiana, a qualitative, content analysis approach was used.

The findings and recommendations of this report are based upon the review and analysis of more than 300 reports and articles, 42 interviews, participation in five conferences, and eight years as facilitators of regional programs and organizations focused on water as the key to Louisiana's economic future.

The rapidly changing political, academic, and business environment in which this research was conducted accelerated in unpredictable and sometimes negative directions both socially and environmentally. Elections, oil prices, budgets, and weather all profoundly (sometimes disastrously) impacted and called into question assumptions based on past and current observations. We strove to deliver findings and recommendations that transcend the dynamics of politics and a fluctuating economy. The result is a report which de-emphasizes historic numbers, dollars, statistics, or trends, but instead focuses on people, actions, plans, and opportunities.

AUTHORS' NOTE

Five significant factors affected and informed this paper.

1. The concept of the Circular Economy

Promoted by the World Economic Forum and supported by the Ellen MacArthur Foundation, the circular economy concept “is restorative and regenerative by design,” and decouples “global economic development from finite resource consumption” by transforming the industrial era’s “take-make-dispose” model to one that mimics and replenishes natural systems [11, 77, 78].

As a species, humans tend to think and act in a linear fashion that fails to align with the cycles and limits of the planet’s natural systems and resources. Our consumptive and disposable lifestyles and growing population are depleting planetary resources to such a degree that decades of progress in improving the human condition are now at risk. The Circular Economy is an opportunity to reframe, and water is central to the process.

2. The Rockefeller Foundation-Lancet Commission Report on Planetary Health, released in 2015 [9]

The Rockefeller-Lancet report reflects growing public recognition of the relationship between the environment and the economy: that the planet gives rise to people who give rise to economies. The Rockefeller-Lancet report declares that planetary health is necessary for human health and the success of all human activities. The commission states that “natural systems are being degraded to an extent unprecedented in human history,” and that remedies “will require the generation of new knowledge, implementation of wise policies, decisive action, and inspirational leadership” [9]. The perspective and language we use in this report is informed by and aligns with the Rockefeller-Lancet Commission’s report.

3. Flaws in using GDP and NAICS

Typically, studies use gross domestic product (GDP), population and employment data to extrapolate various trends and predict future potential. Additionally, industry codes such as the North American Industry Classification System (NAICS) are compiled to paint pictures of business activities and supply chains. Though we reviewed such data in preparing this report, we avoid using GDP and NAICS codes because they consistently fail to capture accurate details regarding water. This complaint is echoed by water cluster leaders and in other studies around the nation and world [40, 79, 80].

The Rockefeller-Lancet Commission shared our discomfort with GDP as an indicator of social and economic wellbeing; it decried the “over-reliance on gross domestic product as a measure of human progress.” Harvard’s Michael E. Porter agrees, and now chairs the Social Progress Imperative, the organization which developed the Social

Progress Index (SPI), a new measure designed to complement GDP [81]. SPI measures indicators “that capture three dimensions of social progress: Basic Human Needs, Foundations of Wellbeing, and Opportunity” [82].

4. COP21

COP21, the 2015 global climate conference in Paris at which more than 190 countries signed a binding agreement to reduce greenhouse gas emissions and resource demands. According to Ceres¹, this agreement will result in “trillions, not billions” of dollars of investment to move the planet to a “low-carbon economy”, a reality that puts Louisiana in a difficult position since much of the state's economy is based on high-carbon industries and activities [83, 84]. State and local leaders have the opportunity, and responsibility, to recognize and respond to this shift by investing in efforts to diversify Louisiana's economy via support for water innovation programs and education.

5. *The financial picture for the State of Louisiana is grim*

The ongoing budget crisis and revenue issues, some of which are affected by the combination of low oil and gas prices and widespread floods in March and August of 2016, are yet to be solved [6, 30]. Because much of the state budget is framed around oil and gas prices above \$60 a barrel, prices below that level put the state's fiscal planners in a quandary. This factor undermined many recent economic analyses and studies that painted rosier pictures of Louisiana's economic climate. It should be noted that over the course of this study, the price of oil dropped from a high of \$112 to a low of approximately \$30 and as of publication is hovering near \$50.

Despite the weight of uncertainty dominating discourse, we remain steadfast and optimistic that water is and will be the foundation of Louisiana's future. We hope our findings and recommendations provide actionable insights to help us become wiser, more circular, more compassionate, and more determined to work together to build a sustainable, equitable water economy that enhances planetary health and the wellbeing of all living things.

Stephen C. Picou and Grasshopper Mendoza
Adaptation Strategies

¹ Ceres is a nonprofit operation at the “nexus of business, investment, and advocacy” focused on “achieving a sustainable global economy by 2020.” Ceres launched a sustainability reporting method for business and government, now called the Global Reporting Initiative, and along with their investor network and research, are influential leaders in the fields of sustainability and adapting to climate change. <http://ceres.org>

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Thanks also to Bob Miller, Deputy Director of the Sewerage & Water Board of New Orleans, for elevating the moral truth of the *shared destiny* of our region, and for his consistent, wise, and compassionate leadership.

Over the course of researching this paper we lost Robbie Evans, a founding board member of the Horizon Initiative, the organization that in late 2008 tapped Grasshopper Mendoza to chair the HI Water Committee (now the Louisiana Water Economy Network), catalyzing a process which ultimately led to this research. Robbie was also an interview subject, and provided sharp insights that informed this report. His legacy lives in our continued efforts to build the Louisiana water economy.

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ABOUT THE AUTHORS



Stephen C. Picou and Grasshopper Mendoza are partners at Adaptation Strategies, an interdisciplinary business consultancy focused on identifying circular economy opportunities in a rapidly changing, resource-constrained world. They are also co-founders of the Louisiana Water Economy Network (formerly the Horizon Initiative Water Committee), which since early 2009 has gathered a diverse, multidisciplinary group of professionals from the public and private sectors to meet regularly in support of integrated water management as key to the economic future of Louisiana. As a result of this work, in 2010 they were tapped by the Greater New Orleans Foundation and The Idea Village to be co-founders of the Water Challenge entrepreneurial competition which they co-managed for four years. For the past five years they have represented Louisiana as part of the EPA Water Cluster Leaders program.

Picou is the author of *Louisiana's Water Innovation Cluster: Is it ready for global competition?* a thesis with which he earned a Master of Science in Urban Studies at the University of New Orleans in 2014. Mendoza holds a degree in International Business from San Francisco State University and is active in commercial real estate. At Adaptation Strategies they focus on economic opportunities in water, resilience, real estate development, green infrastructure, health, and positive aging.

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APPENDIX

INTERVIEWS

Conducted between June 2015 and March 2016, affiliations reflect that timeframe.

Cory Sparks	Louisiana Association of Nonprofit Organizations
Byron Clayton	NexusLA
Will Veatch	USACE
Michael Blum, Ama Rogan, Amy Lesen	Tulane River & Coastal Center
Jeff Carney	LSU Coastal Sustainability Studio
Vivek Shah	Planning Consultant
Elizabeth Williams	LSU Coastal Sustainability Studio
Kai Midboe	The Water Institute of the Gulf
Mark Davis, Chris Dalbom, Caitrin Reilly	Tulane Institute on Water Resources Law & Policy
Steve Mathies	Ramboll Environ
Colette Pichon Battle	Gulf Coast Center for Law & Policy
Meredith Soniat	Regional Planning Commission of New Orleans
Jeff Dauzat	Louisiana Department of Environmental Quality
Elisa Speranza	CH2M
Robin Barnes, Lacey Strosheim	GNO Inc.
Ginny Hanusik	Propeller
Rob Moreau	Turtle Cove Environmental Research Station
Don Blancher	Sustainable Ecosystems Restoration
Susan Fernandes	U.S. Business Council for Sustainable Development
Patty Whitney	Bayou History
Danny Wiegand	EPA Urban Waters Ambassador
Robbie Evans	Con-Tech International
Miriam Belblidia	Water Works
Andrea Calvin	Lake Pontchartrain Basin Foundation
Robert K. Miller	Sewerage & Water Board of New Orleans
Amelia Pellegrin, Emily Federer	Port of New Orleans
Mark Schexnayder	Louisiana Department of Wildlife & Fisheries
Robert Twilley	Louisiana Sea Grant
Dr. Mike Strain	Louisiana Department of Agriculture & Forestry
Bob Thomas	Loyola Center for Environmental Communication
Nihal Shrinath	The Data Center
Tyler Ortego	ORA Estuaries
James Setze, Courtney Maciasz	Capital Region Planning Commission
Christine Jordan	Entergy
Dana Brown	Dana Brown & Associates
Mike Eckert	NO/LA Angels
Nathan Lott	Greater New Orleans Water Collaborative
Justin Ehrenwerth	Gulf Coast Ecosystem Restoration Council
Jo-Anna Lutz Jones	Planning Consultant
Richard Seline	AccelerateH2O
Thom Pepper	Common Ground Relief
Lawliss Turner	A La Carte Foods

Goals & Recommendations of Recent Regional Studies

Closing the Loop, 2013 [85]

- Brand New Orleans for Knowledge and Innovation: “Continue efforts to brand and market New Orleans as a university and research-rich locale (a college town plus, or a knowledge center, with significant student, faculty, program, research, clinical, and innovation assets)”
- Apply Regional Scale for Federal Grants “Create scale and evidence of regionalism required to pursue large-scale federal research and innovation grants, and do pursue those that seem to be a reasonable fit with collective strengths”
- Create a Front Door: “Provide a default *Front Door* entry point to New Orleans institutions for any person or company that does not find its way directly to a specific institution, program, or faculty member. Make the universities more accessible and user-friendly to industry by establishing a common, shared portal—*Front Door*. “
- Create a University-Led Regional Alliance Organization for Innovation

Opportunities for Impact Investment in Coastal and Water Management, 2014 [30]

3 Key “focal opportunities for investment in Louisiana universities that would promote sustainable innovation, technological commercialization and high impact returns.”

1. Coastal Resilience Through Next Generation Coastal Science, Engineering, and Management
2. Water Resources Management and Technology
3. Coastal Resilience and Sustainable Community Planning and Engineering

Other recommendations from *Opportunities for Impact Investment in Coastal & Water Management*:

- State-wide water research coordination network, and/or annual workshops that target water resources work
- Establish and grow advanced, multidisciplinary higher education programs and adult education initiatives across the state. Areas of greatest need:
 - adaptive community planning for ongoing environmental change
 - enhancing access to and capacity for design innovation
 - mechanisms to promote sustainable fisheries management
 - mechanism to promote early adoption of novel design practices to protect critical coastal resources and infrastructure
- Fund interdisciplinary academic degree programs in Coastal Community Resilience/ Sustainable Community Planning or related fields that involve integration of biophysical sciences with social sciences

- 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.

Regional Water Clusters

Water clusters strive to provide a framework for collaboration, coordination, and communication that accelerates the adoption and commercialization of new technologies around diverse water issues. The phenomenon of water innovation clusters as formal economic development organizations is fairly recent, and most water clusters in the United States are less than a decade old.

Water clusters are built around a region's unique mix of assets, and there is no archetype upon which to base a model. Many clusters are small organizations that lack predictable funding and support. Determining whose budget and job bears responsibility for connecting water across multiple agencies, institutions and sectors remains a challenge for clusters. Designing an organization to address myriad complex systems in which water is an inextricable element is also challenging. Louisiana is neither alone or far behind in building its water cluster.

The collaboration that fuels clusters often crosses state lines. Two nearby endeavors, the Maritime Industries Science and Technology (MIST) cluster based at Stennis Space Center in Mississippi, and AccelerateH2O in Texas-0, welcome opportunities to work with Louisiana.

Funded in part by a grant by the Small Business Administration in 2014, MIST is led by the University of Southern Mississippi and Mississippi Enterprise for Technology Inc., and is designed as a multi-state cluster primarily connecting academic and government institutions and agencies. MIST "is a regional group of organizations involved in the development and implementation of applied technologies for working in, working around, and monitoring the marine and coastal environments." [86] MIST focus areas include commercial and recreational fishing, shipbuilding, defense, aquaculture, offshore oil and gas, and environmental restoration. Participating partners include the Louisiana Business and Technology Center at LSU. According to MIST, this cluster includes one the largest concentrations of oceanography resources in the country.

AccelerateH2O is a San Antonio-based NGO connecting private and public resources in business, academia and government to address Texas' many water challenges. Focused on desalination, reuse, smart water, and conservation technologies, AccelerateH2O seeks to catalyze Texas' \$9 billion water technology market. [87] East Texas shares many issues, resources and industries with Louisiana, and AccelerateH2O is interested in developing a collaborative relationship with water cluster efforts in Gulf states. [88]

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The Greater New Orleans Foundation serves the Southeast Louisiana region. For over 30 years, GNOF has been connecting donors to community needs. We help create a resilient, sustainable, vibrant community in which individuals and families flourish and the special character of our region is preserved, celebrated, and supported.

Neighborhood Partnership Network's (NPN) mission is to improve quality of life by engaging New Orleanians, individually and collectively, in neighborhood vitality and civic processes.

At **Adaptation Strategies** we are social innovators working to change the old *take-make-dispose* ethos into a regenerative, circular economy, with a *give more than you take* approach to building successful, resilient communities, businesses, and households. At Adaptation Strategies we *Identify—Triage—Transform!*

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