

Gaining Ground: Structuring Settlement in the Uncertain Economic and Climatic Landscape of the Gulf Coast Mega-Region

The rapid growth of the Gulf Coast mega-region has in significant ways surpassed existing urban, rural, and agrarian settlement systems as the ordering force in the landscape of the Mississippi Delta and Gulf Coast. Coupled with the dislocation resulting from global climate change and coastal land loss, individual communities find themselves unable to leverage their unstable position in the new mega-regional order

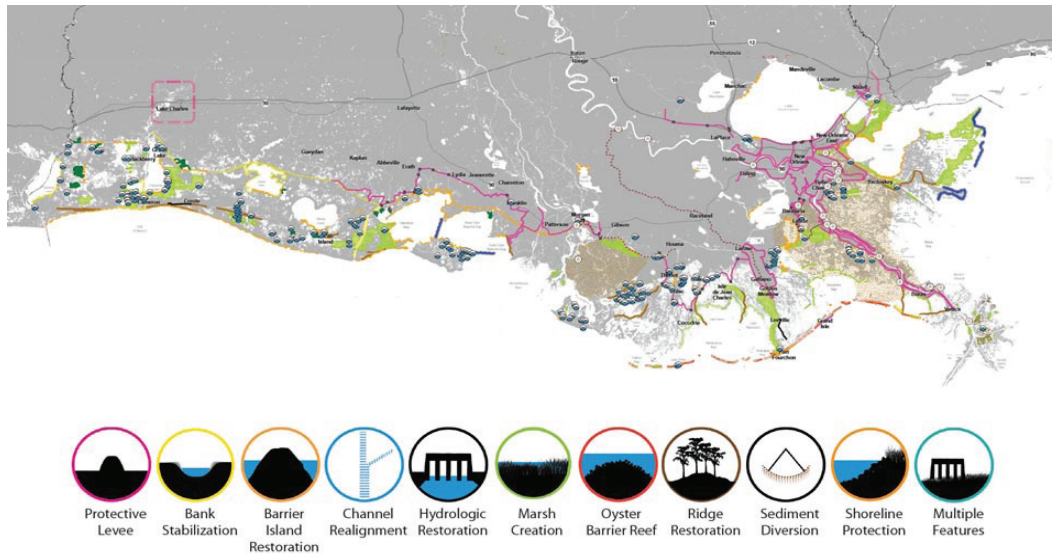
and cope with the tremendous challenges they face. As dire as the situation appears for coastal communities, emerging opportunities for local design and planning are developing in reaction to large-scale government-sponsored ecological planning efforts and the machinations of the global economy.

Gulf Coast communities have long been vulnerable to the unpredictability of the oil market, the fishing industry, and Gulf hurricanes.¹ But traditionally, much of these disturbances was absorbed by the vernacular settlement fabric of communities across the coast. From the simple elevation of coastal homes outside of a surge-protection levee system, to the seasonal traditions of fishing “camp” communities, to the long-lot system of agrarian land settlement along the bayous, these adaptations were themselves formal responses to the challenges of both economy and environment.² The twentieth-century industrial economy and methods of controlling the Mississippi River raised the standard of living across the coast but did so at the expense of the environmental engagement central to the resilient foundation of the Louisiana economy and culture.

The twenty-first-century reshaping of the global natural resources economy, combined with a broad transformation of coastal protection and restoration methods, are forcing the development of largely individual and

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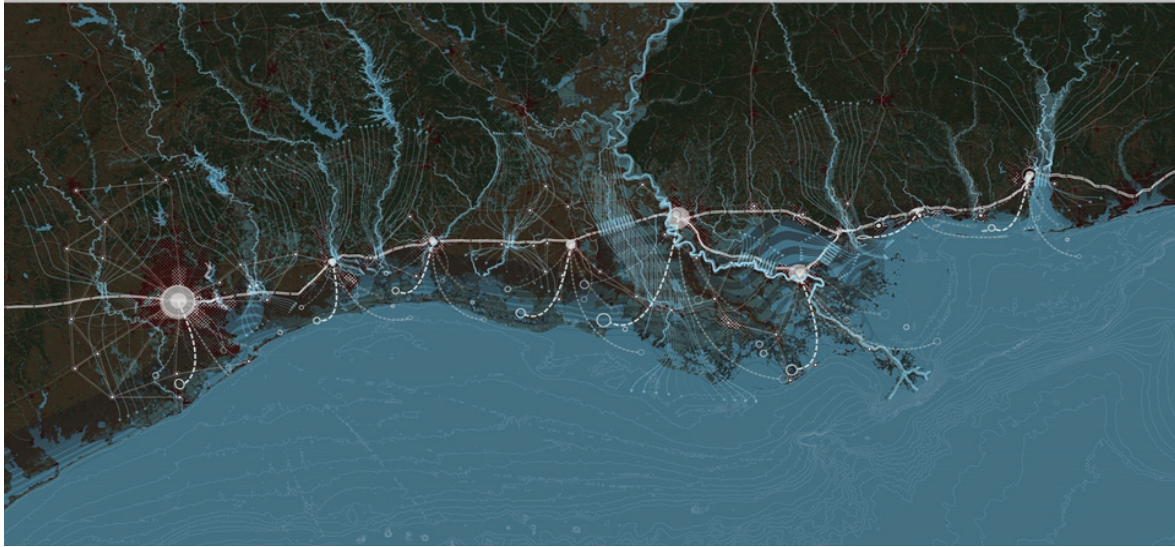
independent community-scaled initiatives. As these trends build, coastal settlements will increasingly find traction in a transformation (and re-appropriation) of traditional land-use and management methods that are fundamentally intertwined with ecological processes. This re-establishment of communities in concert with their dynamic ecological foundations coupled with improved networks of access between coastal communities and the mega-region could work to move the Gulf Coast successfully through the dramatic development and environmental challenges that lie ahead.

This paper considers the transformation of the Delta landscape through the illustration of three trans-disciplinary research and design projects. Each project grapples with the rapidly changing ecological, infrastructural, and settlement landscape of the Gulf Coast mega-region from a different scale and perspective. Far from an abdication of the responsibility of architects and planners, these studies illustrate opportunities for re-emergent and altogether new forms of settlement practice along the Gulf Coast. Rural coastal communities form a large portion of a mega-region of global economic importance situated precariously at the edge of a vast and productive ecosystem. The reliance of this expanding system on an increasingly threatened ecology, reflects a growing conflict facing mega-regions and urbanized delta globally that will have tremendous implications in the coming century.

THE GULF COAST MEGA-REGION: BUILDING THE GRADIENT FROM COAST TO CORRIDOR

The I-10 corridor links small rural communities, mid-sized towns, and major metropolitan areas together into a vast, globally significant mega-region from Texas to Florida. As land loss and sea-level rise continue to encroach upon the Gulf Coast and undermine the vast protective wetlands of the delta, the I-10 corridor will play an increasingly central role in the economic, cultural, and ecological future of coastal Louisiana. Currently, the greater mega-region is developing without vision or control, as a mechanism of the coupled industrialized and natural resource economies of the region and the

Figure 1: Projects and strategies of the 2012 Louisiana State Masterplan for a Sustainable Coast. The plan uses extensive computer models to select 200 from more than 1,000 projects based on their ability to build land and to reduce floor risk. (Credit: Louisiana Coastal Protection and Restoration Authority)



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resultant commercial, industrial, and suburban sprawl is over-running traditional communities, obstructing ecological systems, and out-competing local economies across the coast.

Mega-regions, as defined by urban theorist Richard Florida, are “integrated sets of cities and their surrounding suburban hinterlands across which labor and capital can be reallocated at very low cost”.³ The Gulf Coast mega-region has been recognized as one of 11 American mega-regions defined by the Regional Plan Association as exhibiting cohesion across environmental systems and topography, infrastructure systems, economic linkages, settlement and land-use patterns, and culture and history.⁴ The broader Gulf Coast mega-region had roughly 11,700,000 people in 2000 and accounted for \$524 billion in GDP in 2005, which is roughly 17% of the total production of all 11 mega-regions.⁵ The mega-region thus defined extends from Brownsville, Texas to Pensacola, Florida and includes Houston, New Orleans, and Mobile Alabama.⁶

Focusing on the section of the mega-region along the I-10 corridor between Houston and Mobile illustrates an increasingly urbanized fabric of intertwined port, canal, rail, pipeline, and highway infrastructure of enormous economic value. This stretch of the Gulf Coast includes not only the Port of South Louisiana, the largest American port complex by tonnage, but roughly half of the annual waterborne imports and exports of the United States by tonnage when all of the ports of the region are combined.⁷

The I-10 corridor will serve multiple roles in structuring the future mega-region. First, the corridor is located at a distance from the coast, which makes it a refuge from changing sea levels and rates of land loss along the coast. Relative sea-level rise combined with increased hurricane strength will severely destabilize communities and infrastructure south of I-10 leaving local roads, ports, and rail at risk of “frequent or permanent inundation” according to a recent report by the Federal Highway Administration and the

Figure 2: Gulf Coast mega-Region: The I-10 corridor will increasingly become the conduit that enables a sustained inhabitation of coastal Louisiana. (LSU Coastal Sustainability Studio, 2012)



U.S. Geological Survey on the impacts of climate change. The report states that, “A 20’ storm surge applied across the coast would flood 100% of the roads south of the I-10 corridor”.⁸ The Coastal Protection and Restoration Authority projects a loss of up to 1,750 square miles of land in the next fifty years if major action is not taken to protect and build new land, which will severely exacerbate this risk.⁹ The I-10 corridor will continue to become a refuge in the coming century for coastal communities and sensitive infrastructure flushed out by land loss over time or sudden storm events.

Second, a steady retreat from the coast has already begun. The majority of census tracts along the Gulf coast lost population since 2000. However, the state as a whole saw net population gains over that time period.¹⁰ Communities have shifted investments in new infrastructure and schools northwards and to growing cities and unincorporated areas along the corridor. As communities of the coastal regions south of the I-10 Corridor continue to decline, over the next forty years the mega-region as a whole is expected to double its population from roughly 13,000,000 to 24,000,000 people.¹¹ This shift of density toward the corridor will increase the difference between an increasingly urban corridor and an increasingly rural coast.

The tremendous challenge and opportunity for the I-10 corridor is that the coast remains the dominant asset of the mega-region. Local communities will need to continue to access a vast delta ecosystem that is worth billions of dollars annually in ecosystem services.¹² Navigation and port infrastructure will continue to be located along the coast as will oil and gas infrastructure. This vast coastal economy will be essential to the continued success of the entire mega-region. Individuals and communities engaged in the fishing, oil, and navigation industries are essential to maintain a working coast. The I-10 corridor is the continuous conduit connecting these communities and their products to the broader global economy. At the same time the corridor represents a transitional space where the mega-region must interface with a largely rural economy and community network. These communities, though facing increased threats from storm and land loss, are the access points to the Gulf ecosystem and resource economy that the mega-region relies on so heavily. Legible planning mechanisms for the effective connection between these two distinct entities will build the efficiency and effectiveness of the mega-region while supporting the local relevance and rural quality of individual communities.

BUILDING LAND WITH WATER: RECONNECTING THE MISSISSIPPI RIVER TO ITS DELTA

Over the past 8,000 years, the switching of the Mississippi river built what today is known as the Mississippi River Delta Plain. As it searched for evermore direct routes to the Gulf of Mexico, the river deposited massive quantities of sediment along its growing floodplains. Over the past century of rapid industrialization we have severely disrupted the natural deltaic processes of the river through levees and floodgates. The consequence of this constriction of the river has been the rapid erosion and subsidence of the delta landscape. Adding sea-level rise makes the only viable long-term solution to land loss the reconnection of the river to the delta through large scale

sediment diversion projects designed to pulse the river's high flows into the traditional basins of the delta.

At the turn of the twentieth century, the industrial future of the Mississippi River as the central artery of American exports was clear. It was only a matter of time before the "Mighty Mississippi" was transformed from an imposing force to be overcome into a tremendous asset for American industry. The widespread infrastructural development of the river for navigation and protection following the Great Flood of 1927 coincides with the industrialization of the American economy in the twentieth century.¹³

The destruction of the ecological underpinnings of the delta was a *choice* based on the economic argument that the wealth created by leveeing the river would more than make up for future problems caused to the overall ecological system. An 1897 article in the *National Geographic* magazine sums up this surprisingly candid sentiment,

No doubt the greatest benefit to the present and two or three following generations accruing from a complete system of absolute protection levees, excluding the flood waters entirely from the areas of the lower delta country far outweighs the disadvantages to future generations from the subsidence of the Gulf delta lands below the level of the sea and their gradual abandonment due to this cause.¹⁴

The system built to control the river predetermined an eventual dependence of river and coastal communities on the U.S. government for protection from increased flood risks.

The expectation of government assistance soon formed a "path-dependent" relationship between levee construction and the communities they serve. As levees were built, flooding became greater in the areas that didn't previously have protection, setting off an increased reliance on perpetuating the system. At the same time, communities with levees were busy expanding to fill the newly "protected" land. First, farms expanded to fill the former wetlands but later housing, usually built in ways dangerously ignorant of the flood threat, expanded into areas behind levees.

A century after the writing of the *National Geographic* article, we have reached the time of "gradual abandonment." The article suggests that the economic prosperity for the whole country would be so great that "the People of the whole United States, can well afford, when the time comes, to build a protective levee against the Gulf waters ..."¹⁵ Though the damage has been done as predicted, the national flood protection project has not materialized in the twenty-first century as originally hoped. The scale of such a project has proven to be too great, especially at a time when the national appetite for such large-scale infrastructural projects is at a low point.

The failure of hard infrastructural measures and the scarcity of funds are leading scientists and policy makers to move in a different direction. The active reconnection of the river to its delta plain to build land has been on the theoretical backburner of the restoration and protection debate for



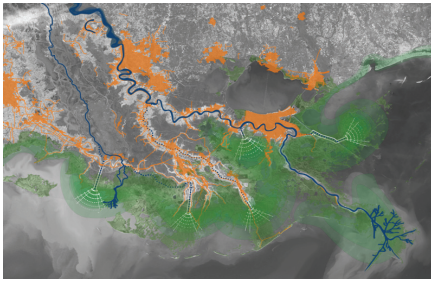


Figure 3: The Five Delta Plan shows a reconnected Mississippi River to its delta. The sediment diversions would pulse water and sediment at high-water stages. The process would mimic the natural process of crevasses that have been closed through levees. (Credit: LSU Coastal Sustainability Studio, 2010)

many years. Coastal scientists agree that even though upriver dams have reduced sediment loads, there is enough sediment in the Mississippi river to maintain and build significant portions of the delta landscape.¹⁶ Designs for an integrated Delta-management system employing freshwater and sediment diversions from the river to nourish wetlands, together with development controls and related investment strategies, were pitched as far back as the 1970s.¹⁷ A later project called the “Third Delta” proposed reconnecting the river at bayou Lafourche and moving water through two channels to the Gulf to build rapidly declining marsh vegetation in Southern Lafourche Parish.¹⁸ These big ideas have until now not progressed past the conceptual stage of development.

These and other plans have traditionally been overshadowed by the state and federal government’s continued focus on and investment in hard protection measures. As recent as the aftermath of Hurricane Katrina, the U.S. Army Corp of Engineers invested billions of dollars in structural protection, furthering our ongoing and growing dependence on structural protection.¹⁹

However, in response to Hurricane Katrina the state of Louisiana has begun to shift this debate through its coastal protection and restoration program. While first developed in 2007, the largest shift in this debate has come through the adoption of the 2012 Louisiana Masterplan for a Sustainable Coast. The plan unambiguously recognizes the challenge of land loss and instead of basing its approach on a collection of small restoration projects, shoreline armoring, dredge sediment marsh creation, and other defensive responses, the master plan is pioneering the systematic design and development of large-scale sediment diversions that will build significant land along the coast.

Paralleling the theory behind the master plan, the design project “Constructing the Delta: Building Land With Water” takes this concept to its logical extreme proposing a series of five strategically inserted, pulsed sediment diversions along the Mississippi to restore subsiding marshes in five of the traditional hydrological basins of the river. These massive spillways, each moving roughly 200,000 cubic feet per second of water (roughly the size of Niagara Falls) will be periodically opened when the Mississippi is high to relieve pressure on the protection levee system in urbanized areas and to build land through the release of river sediments into less inhabited wetlands.²⁰

The diversion concept is a return to a more natural system of land building through deltaic processes without giving up fundamental control of the river. By establishing breaks in the solid control structure that constricts the river across southern Louisiana, we will be embracing increased fluctuation in local water levels across the delta as well as increased fluctuation of salinity levels in oyster beds and coastal fisheries. By giving up a certain amount of control of the river at the local scale, the strategy will increase stability at the regional scale and, in time, help Louisiana avoid a complete collapse of its coastal ecological structure.

This paradigm shift in river management will require coastal communities

and industries to adopt increasingly flexible and opportunistic relationships with the river and the delta. Small settlements existing in the marshes with minimal levee protection will likely experience a significant increase in water levels when diversions are opened. Areas of coastal marsh that have been consistently productive oyster beds for generations will freshen and oysters will have to be seeded in more appropriate waters. Under this framework, communities will have to adapt to the release of massive amounts of water and sediment into the marshes. Those that can develop a more nimble footing through strategies including housing elevation, community relocation, or localized levee protection will continue to access an ecosystem that will increase in strength and vitality with the re-introduction of the river's natural processes. Through a renewed incorporation in planning and architecture of environmental dynamics, communities will be able to sustain themselves in an environment with increased risk.

TRADITIONAL BAYOU SETTLEMENT AND THE TRANSPORTATION NETWORK

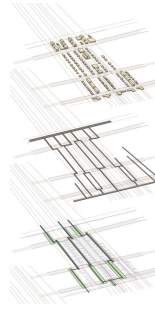
Louisiana settlements have always needed to react to shifting economic and environmental forces. However, the twentieth century turned out to be particularly destructive; not for what was *not* provided to communities to keep them safe, but for what *was*. Levees and pump systems encouraged large expanses of industrial and housing development in formerly unbuildable areas. The dependency resulting from the levees and placelessness of the modern economy transformed the architecture and settlement typologies of the region from tools to engage with a highly specific and rich environment into generic forms wholly dependent on massive protection structures. The slab-on-grade housing construction in places like New Orleans East and the Lower ninth ward point to a deliberate rejection of the regionally specific architecture for ubiquitous American suburban form.²¹ In a very short time-frame coastal communities have lost their ability to react to change.

The current transformations of the mega-region and Mississippi River system will have dramatic effects on the future of coastal communities. The economic and infrastructural changes combined with an increasingly fragile ecological system will test the ability of individual communities to respond, recover, and innovate. Otherwise, vulnerable communities will quite simply, in time, disappear. These coastal communities have a long history of independence and local resilience built into their settlement fabric. Without sentimentalizing particular histories, a re-appraisal of the historic fabric of settlement along the coast uncovers a rich engagement between land and water.

The marsh and bayou landscape has provided a rich ecosystem and natural resource economy on which south Louisiana settlement is based. Hundreds of years of continuous settlement in complex environmental conditions led to a highly articulated and localized development pattern. Negotiations between land and water have shaped the way that people navigate, claim, and dwell along the thin strip of high ground at the bayou edge. The local land-use system of long lots stems from a typology introduced by French and French Canadian settlers to the region nearly 300 years ago. The



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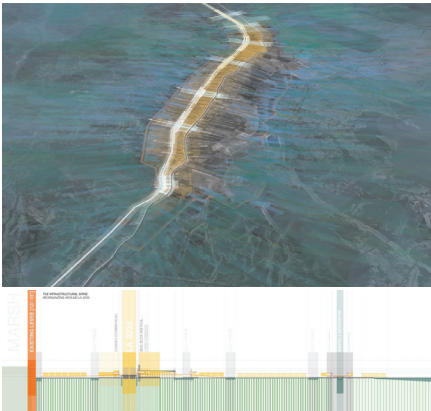


Figure 4: Study of the settlement systems inherent to the Louisiana Long Lot. Though changes have occurred there are still significant lessons for communities located between land and water. (Credit: LSU Coastal Sustainability Studio, 2010)

Figure 5: Projection of future condition in Bayou Lafourche where a traditional “long lot” settlement structure is juxtaposed with a four-lane highway. What has in many places been a failed interface between the local and the regional may be the key to a resilient and productive community and regional interface in coastal Louisiana. (Credit: Cheramie, Carney, Seibert. LSU Coastal Sustainability Studio, 2011)

arpent system of perpendicular concessions set 40 arpents (roughly 1.45 miles) as the standard depth of a lot with the horizontal dimension being variable. Over time these large tracts were divided amongst children as families grew and the system of “long lots” emerged. Traditionally, this system provided each landowner with a cross section through the environment. Buildings would be placed on the high ground near the bayou, land behind houses could be drained and used for farming, while land further back was suitable for grazing. Behind this, the “backswamp” supported trapping and fishing.²² In many parts of the delta this settlement structure remains intact. Increased levee protection in many areas and population growth has undermined some of the environmental necessity of the system but the underlying patterns, circulation system, housing types, lot dimensions, and drainage systems remain today.

The most dramatic force that transformed this settlement pattern was the insertion of the automobile into the landscape within the last 75 years. This has resulted in a distinct hybridization between the traditional bayou fabric and the automotive network that extends far beyond it. The combination of these environmentally determined settlements and a diffuse auto-dependent network would in most places be blamed for the dissolution of the traditional settlement in favor of suburban sprawl. This region is not immune to this critique as modern access has brought a spreading out of many communities and coastal development as a result of easier access. However, as the communities of coastal Louisiana struggle to maintain a much greater degree of self-reliance and resiliency, they will have to balance their internal design and sustainability, often based on a re-emergence of traditional land values²³ with a deliberate engagement with the transportation and regional network beyond. The hybridization of ecologically specific communities connected by a dense transportation network provides trans-coastal access for jobs and raw materials in an increasingly transformational environment. Additionally, the active connections between similarly scaled communities provide a network of resilience and support for those on the leading edge of coastal risk.

The “Measured Change” project in Bayou Lafourche takes on the design opportunities presented by the overlay of highway and local infrastructure to explore the potential for the Long Lot and regional scales to build a lasting and legible interface. The opportunity to regenerate coastal communities lies at this intersection.

CONCLUSION

The mega-region, the master plan, and the network connecting communities are each snapshots of the current conditions of the coastal landscape of Louisiana. As frameworks for analysis, they each reveal processes rapidly reshaping the industrial, ecological, and human landscape of the Gulf Coast mega-region. As tools to frame future design and planning in coastal Louisiana, each provides an entry point for communities to react to changes that transcend the scales and methods of design practice. The rapid and sustained development of the Gulf Coast mega-region, the reconnection

of the Mississippi River to its Delta, and the hybridization of the traditional/contemporary interface of Louisiana communities are each a central thread to the future of this human/ecological/economic landscape. As these three ongoing movements continue, coastal communities will need to develop tools to adapt and react with a far greater degree of autonomy. Communities will have to adapt to a changing and more dynamic landscape while facing the reality that in the coming half century, communities along the Louisiana coast will survive or vanish based on their ability to respond to dramatic shifts both in the local environment as well as the mega-regional economy. However challenging this future may sound, it presents an opportunity for design as the central method for moving communities toward action. For architects and planners working in the region, the future of our communities will rely on an ability to design and envision future scenarios that find opportunity in a dynamic and changing environment. ♦

ENDNOTES

1. Colten, C.E. and A.R. Sumpster, *Social Memory and Resilience in New Orleans*. Nat. Hazards, 2009. 48: p. 356.
2. Edwards, J.D. and N. Kariouk Pecquet du Bellay de Verton, *A Creole lexicon: Architecture, landscape, people 2004*, Baton Rouge: Louisiana State University Press. 269 p.
3. Florida, R., T. Gulden, and C. Mellander, *The Rise of the Mega region*. 2007.
4. Hagler, Y., *Defining US Megaregions*, A. 2050, Editor 2009, Regional Plan Association: New York, NY
5. RPA, *America 2050: An Infrastructure Vision for 21st Century America*, 2008, Regional Plan Association: New York.
6. RPA. *Gulf Coast megaregion*. 2012; Available from: http://www.america2050.org/gulf_coast.html.
7. AAPA. *U.S. Port Rankings by cargo tonnage*. 2010 September 15, 2012; Available from: <http://aapa.files.cms-plus.com/Statistics/2010%20U.S.%20PORT%20RANKINGS%20BY%20CARGO%20TONNAGE.pdf>.
8. Savonis, M., V. Burkett, and J. Potter, *Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I*, G.C.R.I. Office, Editor 2008: Washington, DC.

9. CPRA, *Louisiana's Comprehensive Master Plan for a Sustainable Coast*, C.P.a.R. Authority, Editor 2012: Baton Rouge, LA.
10. Bloch, M., S. Carter, and A. McLean. *Mapping the 2010 U.S. Census*. 2010 September 15, 2012; Available from: <http://projects.nytimes.com/census/2010/map>.
11. America2050. *America 2050 Gulf Coast*. 2012 (cited 2012 September 18); Available from: http://www.america2050.org/gulf_coast.html.
12. Batker, D., et al., *Gaining Ground: Wetlands, Hurricanes and the Economy: The Value of Restoring the Mississippi River Delta*, 2010, Earth Economics: Tacoma, WA.
13. Barry, J.M., *Rising tide: The great Mississippi flood of 1927 and how it changed America 1997*, New York: Simon & Schuster. 524 p.
14. Corthell, E.J., *The Delta of the Mississippi River*. The National Geographic Magazine, 1897. VIII(12): p. 351-354.
15. Ibid.
16. Paola, C., et al., *Natural Processes in Delta Restoration: Application to the Mississippi Delta*. Annual Review of Marine Science, 2011. 3(1): p. 67-91.

W. Kim, D.M., R. Twilley, C. Paola, *Is it Feasible to Build New Land in the Mississippi River Delta?* Eos, 2009. 90(42): p. 373-384.

Day, J.W., et al., *The Impacts of Pulsed Reintroduction of River Water on a Mississippi Delta Coastal Basin*. Journal of Coastal Research, 2009. 10054: p. 225-243.
17. Gagliano, S. and J.V. Beek, *Environmental Management in the Mississippi Delta System*. Transactions-Gulf Coast Association of Geological Societies, 1973. p. 203-210.
18. Gagliano, S. and K. Wicker, *Restoring the Lafourche-Terrebonne Area Using Optimal Components of the Third Delta Conveyance Channel and Dredge Sediment Pipeline Transport*, 2008, Restore or Retreat: Thibodaux, LA.
19. USACE. *Inner Harbor Navigation Canal Surge Barrier*. 2012 September 17, 2012; Available from: <http://www.mvn.usace.army.mil/pd/projectslist/home.asp?projectId=300&directoryFilePath=ProjectData>.
20. Mossop, E. and J. Carney *In the Mississippi Delta: Building with Water*. Places/Design Observer, 2010.

Nordenson, G., et al., *The Mississippi Delta: Constructing with Water*, in *Workbook. The official catalog for Workshopping: An American model of Architectural Practice*, U.S. Pavillion, Editor 2010, Princeton Architectural Press: New York, NY.
21. Colten, C.E. and A. Giancarlo *Losing Resilience on the Gulf Coast: Hurricanes and Social Memory*. Environment: Science and Policy for Sustainable Development, 2011. July-August 2011.
22. Campanella, R., *Time and place in New Orleans: Past geographies in the present day 2002*, Gretna, LA: Pelican Pub. Co. 204 p.
23. CPEX, *Best Practices Manual for Development in Coastal Louisiana* C.F.P. Excellence, Editor 2011, Center for Planning Excellence, Baton Rouge, LA.