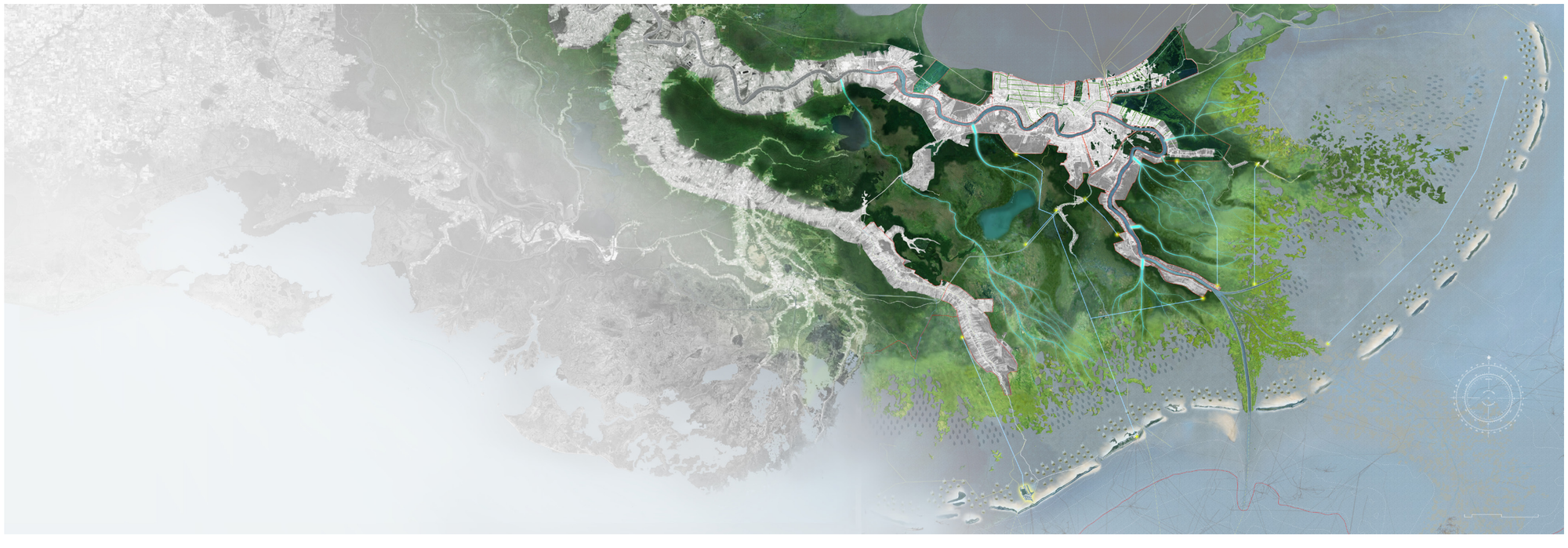
THE NEW

MISI-ZIIBI LIVING DELTA

changing course for the 22nd century



STUDIO MISI-ZIIBI

Changing Course :: Navigating the Future of the Lower Mississippi River Delta

FEBRUARY 2015

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THE NEW **MISI-ZIIBI LIVING DELTA**

a healthy, productive + resilient region

that embraces the community, history, culture, ecology and economy of Louisiana, and is adaptively managed to accommodate the uncertainty of future challenges, needs and opportunities

THE NEW MISI-ZIIBI LIVING DELTA

changing course for the 22nd Century

In a deltaic landscape, change is inevitable and dynamic and the Mississippi River Delta is no exception.
CHANGE IS OCCURRING and WILL CONTINUE TO OCCUR.

Acknowledging that the Mississippi River Delta will continue to evolve over the next 100 years, the vision includes a series of innovative structural and non-structural measures that will result in the new **MISI-ZIIBI LIVING DELTA** for the 22nd century – a healthy, productive and resilient delta.

Studio MISI-ZIIBI's concept of a **LIVING DELTA** is a multi-layered approach that relies on a synergistic and leveraged combination of delta BUILDING, the WORKING delta, and delta LIVING. The MISI-ZIIBI LIVING DELTA uses constructed and natural ecological landscapes to provide for both the safe and sustainable inhabitance of the Delta while encouraging a vibrant, growing and sustainable economy that thrives in light of unpredictable and long-term changes.

This new Delta will build upon the previous six historic delta lobes [Maringouin, Teche, St. Bernard, Lafourche, Plaquemines, and Balize] while responding to the natural deltaic cycle of change. This cycle includes forthcoming geomorphological, fluvial and environmental changes; limited sedimentation and the opportunity for focused land building; potential for expanding the existing naturally self-organizing successional delta ecologies; and continued evolution and development of the delta community and economy. In recognizing and accommodating this cycle of change, the proposal and the measures it entails will result in a **LIVING DELTA**. The proposed region is the deltaic region-plain that conceptually begins at the Old River Control Structure and travels downriver to the Gulf of Mexico, bounded by the high-grounds on the northside of Lake Pontchartrain and the Atchafalaya basin to the west, and the Gulf of Mexico to the south and east.

Presented herein is a proposal for the evolution to a new, **MISI-ZIIBI LIVING DELTA**: a new, innovative approach to a sustainable future for the Lower Mississippi Delta. This proposal is founded on three tenets for the Delta's future (i.e., Building, Working and Living) and features a series of networked and leveraged measures that will yield a healthy, productive and resilient future.

Conceptual Framework

The MISI-ZIIBI LIVING DELTA proposal is predicated on the understanding of a dynamic delta that shifts, meanders and adapts its basin on a cyclical delta lifecycle. The Mississippi River Delta is best understood through the concept of the "Delta Cycle" (Fisk et al., 1954; Roberts, 1997). The Mississippi River Delta was formed through a series of six overlapping delta lobes, with each lobe lasting approximately 500-1,500 years. The delta cycle begins when a new basin captures the flow of the Mississippi River, and its accompanying sediment load. As the river enters open water, the flow expands and sediments are deposited. The process of deltaic sedimentation creates a dynamic landscape with multiple active depositional zones. In effect, each delta lobe is a series of deltas within deltas with multiple fan-shaped deposits ranging between 10s-1,000s of km^2 in area (Day et al., 2007; Roberts, 1997). The current lobe is nearing maturity; coupled with geomorphological conditions of subsidence, faults and climate change, we anticipate the deltaic cycle to migrate north.

Therefore, we propose the 100-year or longer evolution to a seventh Delta Lobe, the MISI-ZIIBI LIVING DELTA region that is well-suited for the current Anthropocene Era characterized by human activities impacting the Earth's ecosystems, due to numerous global environmental changes and specific hydrological and geomorphological changes. This new delta will be more sustainable and smaller in area, but have faster vertical accretion rates than earlier delta lobes (Giosan et al., 2014). The vision for the new delta will be achieved through a combination of natural and human-based processes that initiate and set boundary conditions for sediment distribution, within which the system will be allowed to self-organize. It will have the same general features of early delta lobes, and will evolve in a manner similar to the delta cycle envisioned by Roberts (1997). There will be crevasses and lacustrine deltas in the upper reaches of the system, bay-head deltas in semi-protected marine settings, and coastal sub-deltas at the most distal end. The proposal relies on both natural and anthropogenic deltaic and coastal processes to redistribute sediment to strategic locations. The evolution of the new delta will be closely coordinated with the degradative phase of the sixth (i.e., Balize) lobe, such that desirable estuarine ecologies are created and new wetlands are constructed to enhance the safety and resiliency of coastal communities and critical infrastructure.

This new Living Delta for the Anthropocene Era acknowledges that this is a new phase in the geo-fluvial morphology and the history of the Mississippi River Delta. The proposal consists of a suite of new river outlets (diversions and dredge-siphons), barrier islands, bay islands, reefs (for stabilization and production), expanded wetlands, cypress swamps, and sand engines whose location and function are all linked to their proximity to the proposed new mouth of the Mississippi River. As the river mouth shifts northward, so do the locations of the primary river distributaries, and new ones will be developed, in the form of river diversions and river outlets. Sands and coarse silts will settle out at the mouth of these outlets and, through a combination of natural coastal processes, dedicated dredging, and sand engines, this material will be reworked into a suite of barrier spits. These barrier spits will be augmented with a system of artificial bay islands and oyster reefs to reduce fetch in the bays and will enhance the retention and deposition of sediments needed for wetland formation. The interactions between these quiescent hydrodynamics and the sediment inputs from the river outlets will allow a vast expanse of wetland to form and largely self-organize. These wetlands will help buffer storm surge, allowing human communities closer to the main stem of the river, develop and flourish into the 22nd century.

All of this improve and empower DELTA LIVING in a manner to support and grow a transformative WORKING DELTA. The delta region must be understood and planned as ONE comprehensive spatial entity in which living, working and land-building are mutually supportive and integrated. The key design element is to find the spatial form and character - as suggested herein - that acknowledges a smaller delta area that is economically and culturally vibrant and resilient to the forth-coming environmental changes. It is our position that a smaller delta can be planned and implemented that ultimately achieves a safer and higher quality of life, as well as a more equitable and transformative economy... and lead to long-term multi-generational deltaic sustainability and resiliency.

DELTA BUILDING

Create a new series of deltaic ecosystems arranged according to gradients in elevation and freshwater that will develop within the new Delta. The system will create new swamps and enhance existing swamps in the upper reaches of the system, near and above New Orleans. In the intermediate sections, fresh and intermediate marshes will develop and at the distal ends, brackish, salt marshes, and estuarine-like conditions will develop. All of this implies that the fisheries will move but will have an expanded range of opportunities over the long-term. Furthermore, the slow degradation of the Birdsfoot will result in the conversion of fresh marsh into salt marshes and highly productive brackish water environments. All of this will result in the constructed development and transformation of habitat for some of Louisiana's most prized fisheries and improved safety for communities and businesses.

WORKING DELTA

Delta building will support and assist in growing a prosperous and diverse economy for all of southern Louisiana. Building on its geographic strengths and current economy, the proposal offers symbiotic tools to enable businesses to adapt and transform as conditions in the delta evolve and global markets change. The Delta economy is firmly rooted in its strategic locational and multi-modal transportation infrastructure, linking it to the remainder of the United States as well as its mineral rich landscape. These unique qualities of the economy are vital to the region and nation and are, in turn, widely supported in the plan. Over the long-term, there is an opportunity to expand the economy into new sectors that represent an optional transition into a renewable and productive climate economy.

DELTA LIVING

Culture and diversity, rich and vibrant elements of the Delta are tightly woven into the landscape. The concept of DELTA LIVING is about embracing the ideology and cultural aspect of communities by enabling a means to continue to live with the Delta in new ways. This concept acknowledges the risks and challenges presented by sea-level rise, extreme weather events, and subsidence over the next 100 years, and offers five typologies for living within the Delta. Acknowledging that change will happen, and accommodating the projections into a regional growth strategy, safe, strong, and distinctive communities can still thrive in the Mississippi River Delta.

01 DELTA BUILDING

OBJECTIVE:
Enable a Dynamic, Robust + Adaptable Ecosystem

PRINCIPLES

1. Reconnect the Mississippi River and its Wetlands
2. Focus ECO-3D [dredge + dump, dredge-siphon, divert] Wetland/Land Building
3. Realign the Mississippi River Entrance
4. Build Successional Deltaic Landscapes
5. Ensure a Saline Gradient to Maintain a Diversity of Fisheries, Wildlife and Oyster Habitats
6. Allow for the Natural Transition of the Birdsfoot + Biloxi Marsh
7. Create an Adaptive Management Plan for Sequenced Manifestation

02 WORKING DELTA

OBJECTIVE:
Grow a Diverse, Equitable + Transformative Economy

PRINCIPLES

1. Expand Existing Port Infrastructure + Intermodal Capacity
2. Maintain Reliable Navigation + Increase Mississippi River Channel Depth
3. Build Hydro-Infrastructure Corridors + Sequestration Landscapes
4. Support the Continued Evolution of the Energy Industry
5. Relocate Fishery Leases + Habitats
6. Expand Ecotourism + State / National Wildlife Refuges
7. Incentivize the Climate Economy + Coastal Resiliency

03 DELTA LIVING

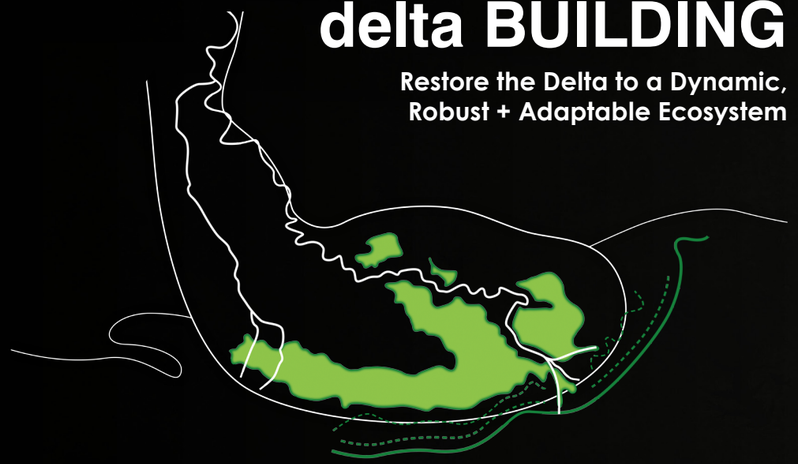
OBJECTIVE:
Develop Safe, Strong + Distinctive Communities

PRINCIPLES

1. Adapt, Retrofit, Revitalize, + Develop Water-Based Communities
2. Embrace the Diverse Way of Life and Culture
3. Create an Investment Strategy for Voluntary Retreat
4. Acknowledge Risk + Provide Levels of Safety
5. Invest in Civic Centers at Strategic + Safe Locations
6. Continue Public Dialogue + Transparent Decision-Making
7. Build Social Capital + Invest for Resiliency

delta BUILDING

Restore the Delta to a Dynamic, Robust + Adaptable Ecosystem



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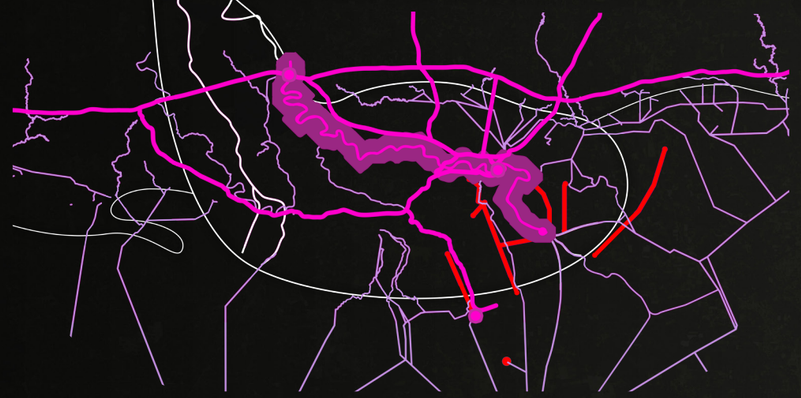
WORKING delta

Enable a Diverse, Equitable + Transformative Economy



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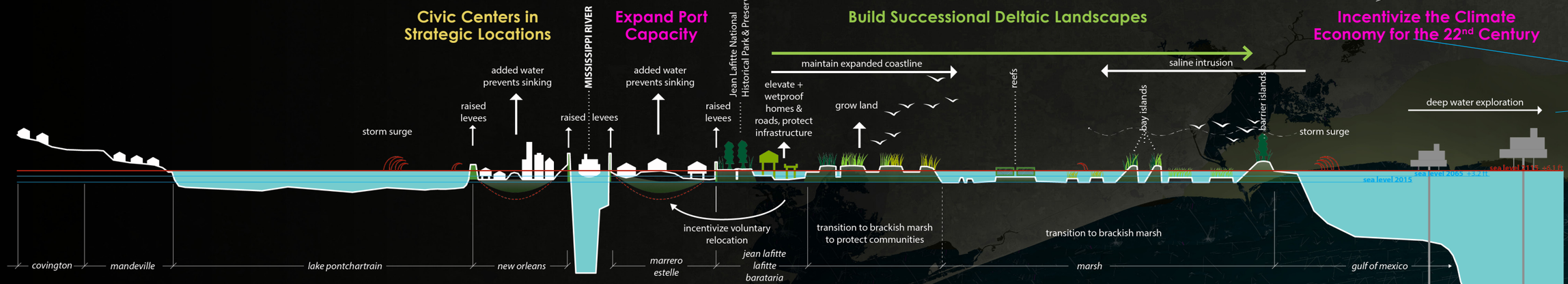
delta LIVING

Develop Safe, Strong + Distinctive Communities

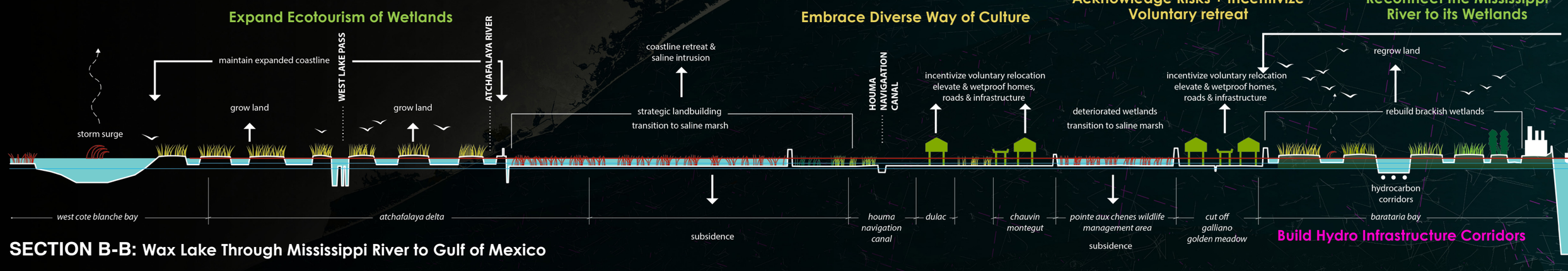
SECTION A-A: Covington to New Orleans to Gulf of Mexico



Adapt, Retrofit, Revitalize, Develop Water-based Communities

Multiple Lines of Defense + Relocate Fishery Habitats

SECTION B-B: Wax Lake Through Mississippi River to Gulf of Mexico

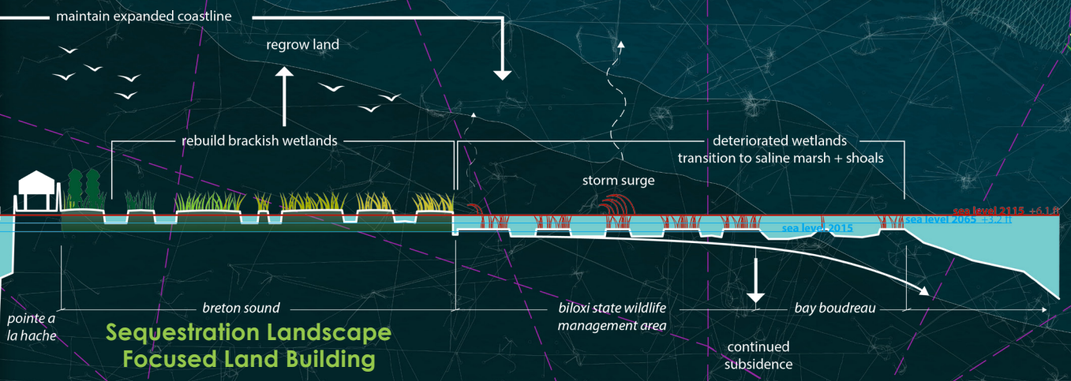


Build Hydro Infrastructure Corridors

= 2115 CONCEPTUAL FRAMEWORK

Louisiana
Old River Control
Mississippi River
new port infrastructure from Baton Rouge to new head of passes
Baton Rouge
Hammond
Covington
Slidell
Gonzales
Lake Maurepas
Lake Pontchartrain
Lafayette
Atchafalaya River
New Iberia
Jeanerette
Metairie
New Orleans
Lake Borgne
Biloxi Marsh Recreation + Wildlife Area
Chandeleur Sound
Belle Chasse
Morgan City
Houma
Shell Island Pass
Wax Lake
Cut-off
Barataria Bay
New Head of Passes
Birdsfoot Recreation + Wildlife Area
Gulf of Mexico
A
B

New Channel Depth of 50'
Realign River Entrance



Sequestration Landscape
Focused Land Building

- Primary Protected Community
- Secondary Protected Community
- River
- Diversion
- Highway
- Existing Wetland
- New Wetland
- Shoal
- Oyster Reef
- Bay Island
- Navigation Channel
- Hydro-Infrastructure Corridor
- Levee
- New Delta
- Well Head + Pipeline
- Barrier Island
- Siphon
- LOOP

03 DELTA LIVING

DEVELOP SAFE, STRONG + DISTINCTIVE COMMUNITIES

Interventions in the Delta

- Delta Parks
- New Public Infrastructure
- Strategic Civic Center Investment
- Future Residential + Commercial Development
- Emergency Evacuation Routes
- Eco-Levee: Modified Morganza to Gulf Levee
- Maintain Hurricane Protection Levees
- Recreational Fishing
- Boating/Marina Areas
- Community Type – Temporary
- Community Type – Accommodate
- Community Type – Revitalize
- Community Type – Retrofit
- Community Type – Develop

COMMUNITY

Communities in the Lower Mississippi River Delta have a paradoxical relationship with water. Water is arguably the most vital economic component of the region and the major reason why people settled in the Delta. Yet, tracing back to the region's historical beginnings and settlements, water has oftentimes been the greatest foe and, therefore, had to be controlled. In this Conceptual Framework of "Delta Living," the vision of a greater understanding and mutual relationship with water will be created, promoted and fostered. The Delta Living vision proposes a transect of water-based community typologies that work *with* water. These varying typologies will bring water to the forefront as a safety organizational element, real estate advantage, and a civic amenity for all. Each of the five typologies has a direct response to its vulnerability with levels of protection, investment strategies and spatial characteristics.

The five types are:
Temporary
Accommodate
Revitalize
Retrofit
Develop

KEY BENEFITS | Central to the idea of safe, strong and distinctive communities is social equity centered on place-specific characteristics of delta living and working with water. Safe and adequate levels of safety exist when each citizen has the opportunity to live, work, and play within their area of residence. It is a fundamental belief that citizens should be able to choose their lifestyle and make informed decisions about where they choose to call home. The proposed plan advocates for choices and trade-offs to be decided by the individual, based upon their needs, lifestyle, and cultural beliefs. Individuals and communities will benefit from the focused investment of civic amenities in higher protected areas. We are strategically locating public infrastructure and civic amenities in areas of highest safety so that these communities can accommodate future population growth. Public infrastructure will receive the highest investment in areas of highest safety in order to encourage population growth and incentivize relocation to areas of low risk and areas with greatest economic growth potential.

IMPACTS | The Conceptual Framework is about informed choices and governance transparency. Delta Living is rich, vibrant, and diverse. This proposal highlights the typology transformations that embrace those characteristics and modify them to adapt to the expected environmental changes over the next 100 years. To accommodate these changes, adaptations to existing infrastructure and policies for development of civic amenities will have to change. Future development of civic amenities and functions (e.g., schools, hospitals, healthcare facilities, parks, municipal functions) will be prioritized and located in the areas of highest safety, that is within engineered protection (levees). This poses a choice to citizens, individually and collectively as to how they would like to live in the Delta.

RISKS | With the idea of voluntary relocation incentives, there is the potential that increasing property values will exceed the buying power of some citizens as demand becomes higher than supply. This risk makes it crucial to build and adapt the five typologies holistically over the next 100 years (and beyond) and to incentivize rational decision-making for the most impoverished populations so they can live in areas of high protection and high amenities. With migration comes the need for new vocations and technical skills for those who choose to relocate; these shifts may follow existing ecological and economic shifts as well. Those who choose to reside outside of engineered and natural process-based protection will be at risk of continued sea-level rise and increased storm surge frequencies. Their built environment will need to be more adaptive and resilient to such forecasts. Minimal public investment will be made in areas of low-safety. However, there may be large private investment due to their potential as a major ecotourism destination. There is also a high probability that populations in these areas will continue to decrease and/or decelerate with the migration to higher protection areas and correlating increased infrastructure. This will be evident in areas of the lower reaches of the Mississippi River; south from West Point à La Hache to Venice as the former river path and Birdsfoot transform into a saline shoal.

ANTICIPATED OUTCOMES | The Delta Living typologies preserve and enrich the already vibrant culture lifecycles of southern Louisiana. Safe, strong and distinctive communities are created with strategic investment strategies for the next 100+ years. All communities are accommodated in some fashion and strongly support citizens to make personal decisions about risk tolerance, access to civic amenities, jobs and social infrastructure. Economic opportunities, social empowerment, and upward mobility are provided and leveraged for all citizens through coordinated economic and residential development. Policies to incentivize relocation will create communities that are equipped with the highest levels of protection in coastal areas, and include readily available civic features and amenities (e.g., schools, hospitals, healthcare facilities, parks, municipal functions). As a result, this adaptable expansion and strategic density extends the cultural, economic and ecological landscape along major growth corridors.

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