OVERVIEW OF THE STATE’S COASTAL MASTER PLAN AND ITS IMPORTANCE TO NEW ORLEANS

Karim Belhadjali, Coastal Protection and Restoration Authority

Feb 25, 2015  Gothenburg – New Orleans City Exchange on Disaster Risk Reduction
Coastal Protection and Restoration Authority

Single state entity with authority to articulate a clear statement of priorities to achieve comprehensive coastal protection for Louisiana.

Mandate is to develop, implement, and enforce a comprehensive coastal protection and restoration Master Plan.
Louisiana’s National Role
Ports - Cargo

- Top tonnage port in the nation
- Five of the top 15 tonnage ports in the US
- One of the largest cargo port complexes in the world
- 19 percent of all domestic waterborne commerce
- Over 30 states depend upon Louisiana’s ports for imports and exports
Annual Tons of Freight by Water

Note: Figure shows dock-to-dock annual shipment volumes (tonnages) by 4-digit Performance Monitoring System Commodity Class and annual shipment volumes (tonnages, dollar-valued trades) to and from U.S. seaports and foreign countries, broken down by 4-digit Harmonized Schedule Commodity Codes.

Data From U.S. Army Corps of Engineers
Total Combined Truck Flows (1998)

NEW ORLEANS

Network Flows (Tons):
- 0 - 2,000,000
- 2,000,000 - 5,000,000
- 5,000,000 - 10,000,000
- 10,000,000 - 25,000,000
- More Than 25,000,000

BEA to State Flows (Tons):
- 0 - 1,000,000
- 1,000,000 - 3,000,000
- 3,000,000 - 9,000,000
- More Than 9,000,000
Seafood and Wildlife

- #1 producer in fisheries in the Lower 48 States
- #2 producer of oysters
- #1 producer of blue crabs
- #1 producer of crawfish
- #1 producer of shrimp
- #1 habitat for migratory waterfowl and songbirds
Ecosystem Services

- Five million waterfowl
- 25 million songbirds
- America’s largest wintering habitat for migratory waterfowl and songbirds
- 70 rare, threatened, or endangered species
- Top source of wild seafood in the continental United States
- Wetlands serve as part of the hurricane protection system
Gulf of Mexico - Energy

2017 Coastal Master Plan
LNG Terminals

[Green]
Natural Gas Market Center Hubs

[Orange]

2017 Coastal Master Plan
Oil Import Sites/Seaports

[Rig Name: Deepwater Horizon
Location: Mississippi Canyon 252]
Petroleum Refineries

[Purple Squares]
Coastal Louisiana: oil & gas infrastructure
Sustainable?
Our Coastal Crisis
Mississippi River Watershed

- Two-thirds of the continental United States
- 42% of the contiguous land mass of North America
Mississippi River and Tributaries

1. Sale - Cypremont
   4600 years BP
2. Teche
   3500 - 2800 years BP
3. St. Bernard
   2800 - 1000 years BP
4. Lafourche
   1000 - 300 years BP
5. Plaquemine
   750 - 500 years BP
6. Balize
   550 years BP

Gulf of Mexico

Mississippi River

Atchafalaya Bay

New Orleans

Mississippi "Bird Foot" Delta
Main Causes of Land Loss

- Levees/Dams
- Subsidence
- Sea-level Rise
- Hurricanes
- Oil and Gas Infrastructure
- Oil Spill
Louisiana is Experiencing a Coastal Crisis

1,883 square miles lost since the 1930s (4,877 sq. km)

Currently losing over 16 square miles per year (41 sq. km)
Land Area Change in Coastal LA 1932 – 2010 SURVEY THE SCENE

Historic Land-Water Change from 1932-2010
Approx. 1,900 sq. mi. (492,100 ha.)
Couvillion et al (USGS), 2011

Land Loss

Land Gain
More Extreme- Potential to lose an additional 1,765 square miles (4,571 sq. km) of land over the next 50 years.

Utilized 0.45 m of sea level rise over 50 years, Subsidence rates 0 to 25 mm per year
Our Coastal Crisis Will Continue

<table>
<thead>
<tr>
<th>Current</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
</tr>
</thead>
</table>

With No Action Over the Next 50 Years
Increasing Vulnerability to Livelihoods

- Current
- Future Without Action

Could experience 10x more damages than today
Leeville Cemetery

1905

1905 Leeville Cemetery... On June 9, 1905, during the yellow fever epidemic, three Leeville residents: Joseph C. Picciola, Camille Rebstock and Adrien Lefort purchased this plot of land from the Martin Family for the Leeville Cemetery Co. for $85. It became a large cemetery, but with each hurricane, graves were demolished and washed away. On September 2, 1905 Joseph C. Picciola died of yellow fever and was buried where his tomb still stands.
Responding to the Crisis

2005 • Hurricanes Katrina and Rita
    • CPRA Board Established
2007 • Original Master Plan Developed
2008 • Hurricanes Gustav and Ike
2009 • CPRA Implementation Office Established
2010 • Deepwater Horizon Oil Spill
2011 • Mississippi River High Water Event
2012 • Master Plan Updated
Louisiana’s Coastal Master Plan
Coastal Master Plan

Guiding document of CPRA and our efforts to protect and restore the Louisiana coast.

Revised every 5 years.
Timeline of Coastal Planning in Louisiana

1927 - Flood Control in the Mississippi Valley in its Relation to Louisiana Fisheries
1928 - Louisiana Wetlands and the Value of Their Wild Life and Fishery Resources
1973 - Environmental Atlas and Multi-Use Management Plan for South-Central Louisiana
1981 - Report on Special Projects for Coastal Louisiana
1982 - Atchafalaya Basin Floodway System, Louisiana (USACE)
1987 - Saving Louisiana's Coastal Wetlands: The Need for a Long-Term Plan of Action (EPA)
1993 - A Long-Term Plan for Louisiana's Coastal Wetlands Restoration Plan (LDPD)
1993 - The Louisiana Coastal Wetlands Restoration Plan (CWPPRA)
1994 - A Long-Term, Comprehensive Management Plan for Coastal Louisiana (LDPD)
1995 - Lake Pontchartrain Basin Foundation Comprehensive Management Plan - Phase III (LPBF)
1996 - The Estuary Compact: Barataria-Terrebonne National Estuary Program (LPBF)
1997 - Louisiana Coastal Wetlands Conservation Plan
1997 - Coast 2000: Toward a Sustainable Coastal Louisiana (Wetlands Conservation & Restoration Authority)
1998 - An Environmental-Economic Blueprint for Restoring the Louisiana Coastal Zone: The State Plan
2000 - The State of Louisiana's Policy for Coastal Restoration Activities
2002 - Mississippi River Sediment, Nutrient, and Freshwater Distribution Study (CWPPRA)
2004 - Saving Coastal Louisiana: Recommendations for Implementing an Expanded Coastal Restoration Program
2006 - Ecosystem Restoration Study (LCA)
2006 - A New Framework for Planning the Future of Coastal Louisiana After the Hurricanes of 2005
2006 - The Multiple Lines of Defense Strategy to Sustain Coastal Louisiana
2006 - Envisioning the Future of the Gulf Coast (America's WETLAND)
2007 - Comprehensive Recommendations Supporting the Use of the Multiple Lines of Defense Strategy to Sustain Coastal Louisiana
2007 - Louisiana's Comprehensive Master Plan for a Sustainable Coast (CPRA)
2009 - Comprehensive Restoration Plan and Addendum (LDPD & EPA)
2009 - Louisiana's Comprehensive Master Plan for a Sustainable Coast (CPRA)
2010 - Louisiana Coastal Protection and Restoration (LPBF)
2010 - Louisiana Coastal Area, Louisiana Ecosystem Restoration (CPRA, USACE)
2012 - Louisiana's Comprehensive Master Plan for a Sustainable Coast (CPRA)
2014 - Mississippi River Hydrodynamic and Delta Management Study (LCA)
Building on the 2007 Master Plan

Figure 4.1: Ecosystem Restoration in the Mississippi River Delta Plain (legend follows on page 13).

Figure 4.6: Ecosystem Restoration and Hurricane Protection for Atchafalaya River Delta, Acadiana, and the Chenier Plain (legend follows on page 23).
2012 Coastal Master Plan

- Built on world class science and engineering
- Evaluated hundreds of existing project concepts
- Incorporated extensive public input and review
- Resource constrained
  - Funding, water, sediment
- Identified investments that will pay off, not just for us, but for our children and grandchildren
Master Plan Objectives

**Flood Protection**
Reduce economic losses from storm-based flooding

**Natural Processes**
Promote a sustainable ecosystem by harnessing the processes of the natural system

**Coastal Habitats**
Provide habitats suitable to support an array of commercial and recreational activities coast wide

**Cultural Heritage**
Sustain Louisiana’s unique heritage and culture

**Working Coast**
Support regionally and nationally important businesses and industries
Evaluation of Hundreds of Existing Projects

Nearly 400 Projects Evaluated Across the Coast
Restoration Projects

- Barrier Island Restoration
- Hydrologic Restoration
- Marsh Creation
- Oyster Barrier Reefs
- Ridge Restoration

- Shoreline Protection
- Bank Stabilization
- Channel Realignment
- Sediment Diversion
Protection Projects:
Structural Protection Projects

Earthen Levee
Concrete Wall
Floodgate
Pumps
Protection Projects: Nonstructural Protection Projects

- Elevated Housing
- Floodproofing
- Voluntary Acquisition
Using New Tools, Breaking New Ground

Diagram showing relationships between Ecohydrology, Wetland Morphology, Vegetation, Ecosystem Services, Barrier Shoreline Morphology, Storm Surge/Waves, and Risk Assessment.
Coastal Louisiana Risk Assessment (CLARA) Model Estimates Economic Damage from Coastal Flooding

Estimates flood depths across the coast

Determines direct economic damage

- Builds on post-Katrina flood modeling efforts
  - LACPR
  - IPET Risk and Reliability
  - FEMA HAZUS-MH

- Provides balanced resolution for future risk estimates
  - Estimates damage reduction from many structural and nonstructural options
  - Considers many scenarios
CLARA Proceeds in Three Calculation Steps

Statistical Pre-Processing Module

Flood Depth Module

Economic Module

2017 Coastal Master Plan
Damage Dollars

Damage is estimated for the following types of assets:

- single-family residences
- manufactured homes
- small multifamily residences (e.g., duplex, triplex)
- large multifamily residences (e.g., apartment building, condominium)
- commercial properties
- industrial
- public facilities
- transport infrastructure (e.g., roads, bridges, rail)
- vehicles
- agriculture structures and properties
- agricultural crops
Risk Reduction Projects Evaluated Using CLARA Included Structural Projects...

- Earthen levees
- Concrete T-walls
- Floodgates
- Pumps
...and Non-Structural Projects

- Elevation
- Floodproofing
- Voluntary acquisition
# Predictive Models Team

<table>
<thead>
<tr>
<th>Predictive Model</th>
<th>Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecohydrology</td>
<td>Ehab Meselhe, PhD, PE, ULL + 9 members</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Jenneke Visser, PhD, ULL + 8 members</td>
</tr>
<tr>
<td>Wetland Morphology</td>
<td>Greg Steyer, PhD, USGS + 6 members</td>
</tr>
<tr>
<td>Barrier Island Morphology</td>
<td>Mark Kulp, PhD, UNO + 6 members</td>
</tr>
<tr>
<td>Ecosystem Services</td>
<td>Andy Nyman, PhD, LSU + 8 members</td>
</tr>
<tr>
<td>Storm Surge</td>
<td>Joe Suhayda, PhD, Arcadis + 3 members</td>
</tr>
<tr>
<td>Storm Damage/Risk</td>
<td>Jordan Fischbach, PhD, RAND + 7 members</td>
</tr>
<tr>
<td>Data Integration</td>
<td>Craig Conzelmann and USGS team</td>
</tr>
<tr>
<td>Uncertainty Analysis</td>
<td>Emad Habib, PhD, ULL</td>
</tr>
<tr>
<td>Technical Advisor</td>
<td>Denise Reed, PhD, UNO</td>
</tr>
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</table>
Future Scenarios

Moderate Scenario

771 square miles lost

Less Optimistic Scenario

1,765 square miles lost

Factors Accounted for by Our Scenarios

- Sea Level Rise
- Subsidence
- Storm Intensity
- Storm Frequency
- River Discharge / Sediment Load
- River Nutrient Concentration
- Rainfall
- Evapotranspiration
- Marsh Collapse Threshold
Variation in Sea Level Rise (Eustatic)

Estimates of Sea Level Rise over Next 50 Years

On-going analysis is incorporating new research and evaluating a scenario of 0.78 m over 50 years.
Variation in Subsidence Rates

Subsidence Advisory Panel Members: Louis Britsch, PhD, PG, USACE-MVN; Roy Dokka, PhD, LSU; Joseph Dunbar, PG, USACE-ERDC; Mark Kulp, PhD, UNO; Michael Stephen, PhD, PG, CEC; Kyle Straub, PhD, Tulane; Torbjorn Tornqvist, PhD, Tulane
The Analytical Challenge

• Complex coastal environment
  – Wetlands, bays, barriers/Rural, urban, industry

• Planning horizon
  – 50 years – need to consider change over time

• Multiple future scenarios

• Projects
  – 210 restoration projects
  – 34 Structural protection projects
  – 112 Non-structural protection projects

• Diverse community needs, competing stakeholder preferences
There is No Optimal Solution – Tough Decisions Must Be Made

- Risk reduction
- Use of river diversions
- Near term benefits

- Restoration
- Maintenance of current salinity gradients
- Long term sustainability
The Planning Tool Is a Computer-Based Decision Support Tool

1. Compares and ranks individual projects

2. Develops different combinations of projects for comprehensive strategy

3. Uses interactive visualizations to display tradeoffs and support decision making
Key Decision Points

• Flood Risk Reduction and Land Building as Decision Drivers
• Funding Allocation – $50 Billion, 50/50 split
• Near Term and Long Term Benefits – 50/50 split
• Selecting Projects for an Uncertain Future
• Use of Decision Criteria and Ecosystem Services
• Land Building Experiments
Explored Funding Scenarios and Allocation Between Risk Reduction and Restoration Projects

![Graph showing funding scenarios and allocation percentages](Image)
Evaluated Balance Between Near Term and Long Term Benefits
Planning Tool Evaluates Hundreds of Restoration and Risk Reduction Projects

43 Sediment diversion
101 Marsh creation
96 Other restoration
34 Structural risk reduction
112 Non-structural risk reduction

Implementing all projects would cost more than $200 billion
Planning Tool Compares Individual Projects

Near and Long Term Land

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Project Type</th>
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</thead>
<tbody>
<tr>
<td>Pass a Loutre Channel Re-alignment with Up River Diversions</td>
<td>Channel re-alignment</td>
</tr>
<tr>
<td>Pontchartrain-Barataria Multi-Diversion Plan</td>
<td>Diversion</td>
</tr>
<tr>
<td>Up River Re-allocation (60/20)</td>
<td>Channel re-alignment</td>
</tr>
<tr>
<td>Up River Re-allocation (90/10)</td>
<td>Channel re-alignment</td>
</tr>
<tr>
<td>Up River Re-allocation (50/50)</td>
<td>Channel re-alignment</td>
</tr>
<tr>
<td>Mid-Barataria Diversion (250,000 cfs- 2nd Increment)</td>
<td>Diversion</td>
</tr>
<tr>
<td>Upper Breton Diversion (250,000 cfs)</td>
<td>Diversion</td>
</tr>
<tr>
<td>Down River Re-allocation (10/50)</td>
<td>Channel re-alignment</td>
</tr>
<tr>
<td>Hermitage Diversion (250,000 cfs Seasonally Operated)</td>
<td>Diversion</td>
</tr>
<tr>
<td>Mid-Barataria Diversion (250,000 cfs)</td>
<td>Diversion</td>
</tr>
<tr>
<td>Biloxi Marsh Creation</td>
<td>Marsh Creation</td>
</tr>
<tr>
<td>Lower Barataria Marsh Creation</td>
<td>Marsh Creation</td>
</tr>
<tr>
<td>Mid-Barataria Diversion (50,000 cfs - 1st Increment)</td>
<td>Diversion</td>
</tr>
<tr>
<td>Golden Meadow-Montegut Marsh Creation</td>
<td>Marsh Creation</td>
</tr>
<tr>
<td>West Pointe a la Hache Diversion (250,000 cfs)</td>
<td>Diversion</td>
</tr>
<tr>
<td>Up River Re-allocation (10/50)</td>
<td>Channel re-alignment</td>
</tr>
<tr>
<td>Dulac-Cocoche Marsh Creation</td>
<td>Marsh Creation</td>
</tr>
<tr>
<td>Down River Re-allocation (50/50)</td>
<td>Channel re-alignment</td>
</tr>
<tr>
<td>Large-Scale Barataria Marsh Creation</td>
<td>Marsh Creation</td>
</tr>
<tr>
<td>North Terrebonne Bay Marsh Creation</td>
<td>Marsh Creation</td>
</tr>
<tr>
<td>East Maurepas Diversion (5,000 cfs)</td>
<td>Diversion</td>
</tr>
<tr>
<td>Bonnet Carre Diversion (5,000 cfs)</td>
<td>Diversion</td>
</tr>
<tr>
<td>Humble Canal Hydrologic Restoration</td>
<td>Hydrologic Restoration</td>
</tr>
<tr>
<td>Mermentau River Hydrologic Restoration</td>
<td>Hydrologic Restoration</td>
</tr>
<tr>
<td>Central Wetlands Diversion (50,000 cfs)</td>
<td>Diversion</td>
</tr>
</tbody>
</table>

![Bar chart showing change in land area for Near Term Land (Year 20) and Long Term Land (Year 50).]
Operation at capacity when Mississippi River exceeds 900,000 cfs; operation at 50,000 for flows from 900,000 cfs to 600,000 cfs; operation at 8% of river flow for river flows from 600,000 cfs down to 200,000 cfs, no operation below 200,000 cfs
Year 50
Change in Percent Land Compared to FWOA

Scenario B
Grounded in Science

**Risk Reduction**
- Expected Annual Damages

**Restoration**
- Land Area

---

### Decision Criteria and Ecosystem Services

**Risk Reduction**
- Distribution of flood risk across socioeconomic groups
- Flood protection of historic properties
- Flood protection of strategic assets
- Operation and maintenance costs

**Restoration**
- Sustainability
- Support for navigation
- Use of natural processes
- Support for cultural heritage
- Support for oil & gas

**Ecosystem Services**
- Oyster
- Shrimp
- Freshwater Availability
- Alligator
- Waterfowl
- Saltwater Fisheries
- Freshwater Fisheries
- Carbon Sequestration
- Nitrogen Removal
- Agriculture/Aquaculture
- Other Coastal Wildlife
- Nature-Based Tourism
Planning Tool Assembles Different Project Combinations to Meet Louisiana’s Objectives

- Uses constrained mixed integer program to select combinations of projects that maximize land building and risk reduction

Objective Function:
Let $d_j$ represent the weight for decision criterion $j$.

$$\text{Max } [d_1(\text{Alternative Near-term Reduction in EAD}) + d_2(\text{Alternative Long-term Reduction in EAD}) + d_3(\text{Alternative Near-term Coast wide Land Area}) + d_4(\text{Alternative Long-term Coast wide Land Area})]$$
Planning Tool Assembles Different Project Combinations to Meet Louisiana’s Objectives

- Choices are constrained by funding, available sediment, and river flow

\[
\sum_{p_e} \sum_i \left( \text{Cost}_{p_e,i,t} \times x_{p_e,i} \right) \leq \text{Restoration Funding}_{t}, \quad \text{for all values of } t \ (\forall t)
\]

\[
\sum_{p_r} \sum_i \left( \text{Cost}_{p_r,i,t} \times x_{p_r,i} \right) \leq \text{Risk Reduction Funding}_{t}, \quad \forall t
\]

\[
\sum_{p_e} \sum_i \left( \text{Sediment Required}_{p_e,i,t,s} \times x_{p_e,i} \right) \leq \text{Sediment Available}_{t,s}, \quad \forall t, s
\]

\[
\sum_{p_e} \sum_i \left( \text{River Flow Diverted}_{p_e,i,z} \times x_{p_e,i} \right) \leq \text{River Flow}_{z}, \quad \forall z
\]

\[
\sum_{p_e} \sum_i \left( \text{River Reach Indicator}_{p_e,k} \times x_{p_e,i} \right) \leq \text{Allowable Number of Diversions}_{k}, \quad \forall k
\]
Louisiana’s 2012 Coastal Master Plan
Max Land/Max Risk Alternative
Coast-wide Trends in Land Area Under FWOA and Future With Alternative: Moderate Scenario

Time Period

Alternative
- Master Plan (Restoration)
- Draft Plan (Restoration)
- Max Land (Moderate)
- Max Land (Less Optimistic)

Future Without Action
Planning Tool Assembles Different Project Combinations to Meet Louisiana’s Objectives

- Combinations balance ecosystem health, navigation, and other coastal interests

\[ \Sigma_p \Sigma_i (\text{Metric}_{p,i} \times x_{p,i}) \geq \text{Performance Threshold} \]

Coastal habitats

\[ \Sigma_p \Sigma_i (\text{Decision Criterion Score}_{p,i} \times x_{p,i}) \geq \text{Performance Threshold} \]

Decision Criteria
Science and Engineering Board

**Ecosystem Science / Coastal Ecology**
- William Dennison, PhD, University of Maryland
- Edward Houde, PhD, University of Maryland
- Katherine Ewel, PhD, University of Florida

**Engineering**
- Robert Dalrymple, PhD, PE, Johns Hopkins University
- Jos Dijkman, MsC, PE, Dijkman Delft

**Geosciences**
- Charles Groat, PhD, University of Texas at Austin

**Social Science and Risk**
- Greg Baecher, PhD, PE, University of Maryland
- Philip Berke, PhD, University of North Carolina – Chapel Hill

**Climate Change**
- Virginia Burkett, PhD, U.S. Geological Survey

**Environmental/Natural Resource Economics**
- Edward Barbier, PhD, University of Wyoming
Technical Advisory Committees

Predictive Models

• Steve Ashby, PhD, USACE Eng. Res. Dev. Center
• John Callaway, PhD, University of San Francisco
• Fred Sklar, PhD, South Florida Water Mgmt. District
• Si Simenstad, MS, University of Washington

Planning Tool

• John Boland, PhD, PE, John Hopkins
• Ben Hobbs, PhD, John Hopkins
• Len Shabman, PhD, Virginia Tech

Cultural Heritage

• Don Davis, PhD, Louisiana State University
• Maida Owens, LA Dept. of Culture, Recreation, and Tourism
• Carl Brasseaux, PhD, University of Louisiana Lafayette
Grounded in Science

Risk Reduction
- Distribution of flood risk across socioeconomic groups
- Flood protection of historic properties
- Flood protection of strategic assets
- Operation and maintenance costs

Restoration
- Sustainability
- Support for navigation
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Decision Criteria and Ecosystem Services
- Oyster
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- Alligator
- Waterfowl
- Saltwater Fisheries
- Freshwater Fisheries
- Carbon Sequestration
- Nitrogen Removal
- Agriculture/Aquaculture
- Other Coastal Wildlife
- Nature-Based Tourism
Responsive to the Needs of Our Coastal Communities
Outreach and Engagement Groups

Incorporating Citizen & Stakeholder Knowledge into the Planning Process
Over 30 Federal, State, NGO, Academic, Community, and Industry Organizations
Focus Groups

• Key industries are impacted by land loss and large scale protection and restoration efforts

• Created three focus groups:
  – Navigation
  – Fisheries
  – Oil and Gas

• Expanding membership to:
  – Landowners
  – Community groups
Extensive Public Outreach and Review

- Regional community meetings held throughout the coast July – September 2011
- Meetings with Fisheries, Oil and Gas, and Navigation Focus Groups
- Presentations to the CPRA and Governor’s Advisory Commission for Coastal Protection, Restoration, and Conservation
- Framework Development Team members representing community, industry, federal, state, NGO, and academic organizations
- Presentations to civic, business, non-profit, and other professional groups
- Attendees at regional community meetings
Extensive Public Outreach and Review

- 3: Open house and public hearings held to receive feedback on draft plan: New Orleans, Houma, and Lake Charles
- 750: Attendees at the public hearings
- 100: Public comments received on draft plan at public meetings
- 2,200: Public comments received on draft plan
- 11,000: People visited the plan website during the public comment period
Louisiana’s 2012 Comprehensive Master Plan for a Sustainable Coast
Keystone of the 2012 Master Plan: Reconnecting the River
The projects in the plan would use up to 50% of the Mississippi River’s peak flow for sediment diversions, in addition to using water and sediment from the Atchafalaya River.
What the Master Plan Delivers

Potential Expected Annual Damages from Flooding at Year 50

- **Moderate Scenario**:
  - Future Without Action: $7.7 Billion
  - Master Plan: $2.4 Billion
  - Decrease: $5.3 Billion

- **Less Optimistic Scenario**:
  - Future Without Action: $23.4 Billion
  - Master Plan: $5.5 Billion
  - Decrease: $18 Billion

2017 Coastal Master Plan
What the Master Plan Delivers

Potential Annual Rates of Land Change Over the Next 50 Years

2012-2021 2022-2031 2032-2041 2042-2051 2052-2061

Rate of Annual Land Change (Square Miles/Year)

Future Without Action Master Plan

No Net Loss

1st time since 1930s Louisiana gains land annually
What the Master Plan Delivers

2061: Future Without Master Plan

2061: Future With Master Plan

2011: Current Landscape
Implementing the Plan
Since 2007, we have

- 26,000+ acres of land benefitted
- 250+ miles of levee improved
- 45 miles of barrier islands constructed
- 95.4 million cubic yards of fill placed

$18B secured for restoration and protection projects
Progress on the Ground
Projects 2007–present

Restoration Projects

- Barrier Island Restoration: $1,024
- Marsh Creation: $457
- Shoreline Protection: $362
- Hydrologic Restoration: $92
- Freshwater Diversions: $40
- Oyster Barrier Reefs: $2
- Other Restoration Projects: $29
- Total: $2,024,000,000

Source: [inactive URL]
Progress on the Ground
Projects 2007-present

Protection Projects

- Greater New Orleans Hurricane Protection System: $8.7 billion
- Other Protection Projects: $2.4 billion
- Infrastructure Projects: $0.055 billion

Total: $11,184,000,000
Restoring Barataria Basin
BEFORE AND AFTER
Shell Island East

May 2013

Dec 2013
Caminada Headland Beach and Dune Restoration INCR 2

Status: Headed to Construction

Estimated Project Cost: $147M
Flood Protection

Major Components

- Levees
- Floodwalls
- Pump Stations
- Sector Gates & Barge Gates
- Locks

Role of CPRA

- Design and Review
- Construction Oversight & Review
- Levee Inspections
- Emergency Response Teams
Flood Protection

Major Projects

- St. Charles Parish Levee
- New Orleans Drainage Canals
- Seabrook Floodgate
- Lake Cataouatche Levee
- West Closure Complex
- Eastern Tie-In Hero to Oakville
- St. Bernard Levee & Floodwalls
- Lake Borgne Surge Barrier
- Bayou Dupre Sector Gate
Flood Protection

GIWW West Closure Complex (Pump Station)
Flood Protection
GIWW West Closure Complex

September 2010 – Pump Installation

March 2011 – Gate Placement

March 2011 – Pump Station Interior
Flood Protection

IHNC Lake Borgne Surge Barrier
Projected FY16 Expenditures

By Project Phase

- Construction: 65% ($503 million)
- Engineering and Design: 9% ($73.7 million)
- Planning: 13% ($25 million)
- Operation, Maintenance and Monitoring: 5% ($99.3 million)
- Ongoing Programs and Initiatives: 5% ($35.1 million)
- Operating Costs: 5% ($37.6 million)

Construction includes Beneficial Use ($4 million)
OM&M includes BIMP ($361,000), Repair/Rehabilitation of Projects ($1.1 million), Marine Debris Removal ($1.6 million), and Isaac Beach and Dune Recovery ($45.8 million)

Ongoing Programs includes Project Support ($4.1 million)

Total Expenditures
$773 Million
Projects Scheduled for Construction in FY16

2017 Coastal Master Plan
2012 Coastal Master Plan

Freshwater and Sediment Diversions

- Mississippi Sediment Diversions
- Freshwater Diversions
- Atchafalaya Sediment Diversions
Mississippi Sediment Diversions

Building On What We Know

Mississippi River

Diversion

Outfall Areas

Basin-Wide Influence

Coastal Communities

System Management
Mississippi River Sediment Diversions: Process

2012 MASTER PLAN (Mississippi River Diversion Recommendations)

- LOWER BRETON (50,000 cfs)
- LOWER BARATARIA (50,000 cfs)
- MID BRETON (5,000 cfs)
- MID BARATARIA (50,000 cfs)
- MID BARATARIA (250,000 cfs)
- UPPER BRETON (250,000 cfs)

FEASIBILITY-LEVEL MODELING
(Site specific data collection and refined 2012 MP Models, river modeling, and localized Delft3D)

MR HYDRODYNAMIC & DELTA MANAGEMENT
(River and basin side modeling)

FISHERIES MODELING
(CASM and EwE coupling with Basin-Wide Delft3D and MRHDM AdH)

SOECIOECONOMIC EVALUATION
(Social, economic, and fisheries impacts — past/present/future)

BASIN-WIDE INTEGRATED HYDRODYNAMIC, MORPHOLOGICAL & NUTRIENTS MODELING
(Analyze Sequencing and Operation of recommended suite of diversions)

WINTER 2014
CPRA DECISION TO ADVANCE PARTICULAR ALTERNATIVES VIA VERIFICATION OF MASTER PLAN BENEFITS AND COSTS
(Land/Site/Size/Cost/Constructability)

PRELIMINARY DESIGN
(varying levels — LCA feasibility, 10%, 30%)

EXTERNAL TECHNICAL REVIEW
(Review/comparison of cost and design assumptions and constructability determination)

DECEMBER 2016
CPRA/FED DECISION TO IMPLEMENT
(Federal Interest Determination — Chief’s Report)

SUMMER 2015
CPRA DECISION TO IMPLEMENT
(Advance to full engineering and design)

DATA SYNTHESIS/VISUALIZATION
(SSPM and Coastal Sustainability Studio)

2017 MASTER PLAN
(Recommendations would be included as part of evaluation)

SWAMP
(Pre/post construction and coast-wide monitoring, adaptive management)

DIVERSIONS ADVISORY PANEL, DIVERSIONS SUB-COMMITTEE & PUBLIC ENGAGEMENT

WINTER 2014
CPRA DECISION TO ADVANCE PARTICULAR ALTERNATIVES VIA VERIFICATION OF MASTER PLAN BENEFITS AND COSTS
(Land/Site/Size/Cost/Constructability)

EXTERNAL TECHNICAL REVIEW
(Review/comparison of cost and design assumptions and constructability determination)
Center for River Studies
The Water Campus
Implementing the Master Plan
Monitoring and Reporting our Progress

- Continue and expand monitoring stations along the coast
- Modify tools based on on-going monitoring to help better predict future conditions
- Assess monitoring data, formalize feedback loops and triggers for modifications
- Expand monitoring to include Performance Measures that provide an indication of our progress toward achieving the objectives of the Master Plan
- Measure and report on project performance and system response
Systemwide Assessment & Monitoring Program
Implementing the Master Plan

Tackling Future Challenges

Climatic changes can challenge the sustainability of some proposed projects requiring adaptation

Sustainability of Marsh Creation Projects*

* Orleans Parish
* Terrebonne Parish
* Cameron Parish
The Louisiana Legislature requires that the Master Plan be updated every five years with the latest science and technical information.
Advancements and Updates

• Implementation of the model improvement plan
• Potential for project list modification
• Public input and political acceptance
• Development of Flood Risk and Resilience Program
• Socio-economics and fisheries distribution analysis for areas in Breton, Barataria and Terrebonne
Advancing our Technical Analysis

2017 Coastal Master Plan
Model Improvement Plan
2017 Model Improvement Plan
Collaborative Team of over 70 Experts

Modeling Decision Team
Directs and coordinates model improvements and analysis

Subtask Leaders and Members:
2017 Model Improvement Plan

Integrated Compartment Models (ICMs)
CLARA Model Improvement Plan

Model Updates for the 2017 Master Plan

• Expand study region further inland to reflect an expanding floodplain

• Develop a higher-resolution spatial unit of analysis
  – Previous: U.S. Census block centroids
  – New: At least 1x1 km grid

• Update
  – Data on individual structures/parcels (selected parishes)
  – Strategic assets and critical infrastructure
  – 2010 Census updates

• Validate CLARA with Hurricane Isaac flood and damage data
Geospatial Improvements

Expanding the Study Region

CLARA 2017 max extent
Geospatial Improvements

Developing a New Spatial Unit

• CLARA v1.0 included ~35K census block centroids

2000 US Census block centroids within 2012 max extent
Geospatial Improvements

Developing a New Spatial Unit

- CLARA v2.0 includes ~114,000 grid points
  - Note: ~90K points in LA, ~14K in MS, ~10K in TX

- CLARA 2017 grid points
THANK YOU

coastal.la.gov

Karim.Belhadjali@La.Gov