Environmental Studies Program: Ongoing Study

Study Area(s): Gulf of Mexico OCS

Administered By: Gulf of Mexico OCS Region

Title: Economic Cost and Geomorphic Comparison of Outer Continental Shelf (OCS) Sand versus Nearshore Sand for Coastal Restoration Projects (NSL #GM-14-03-06)

BOEM Information Need(s) to be Addressed: Coastal restoration and management programs along the Gulf and Atlantic coasts are becoming increasingly reliant on OCS sediment resources to supplement sediment-starved coastal systems providing storm protection, mitigating for coastal erosion, and restoring coastal habitat. The Bureau of Ocean Energy Management (BOEM) Marine Minerals Program partners with Federal, state, and local coastal managers to provide OCS sediment resources for public works projects through noncompetitive negotiated agreements under Section 8(k) of the Outer Continental Shelf Lands Act (OCSLA; 43 U.S.C. 1337(k)(2)). While it is well understood that introducing sediment from outside the active coastal system is more beneficial than using in-system resources, offshore sediment is more costly to use because of longer transport distances. In some cases it has been demonstrated that using nearshore resources would do more harm than good because of disruptions to natural sediment transport pathways and alterations to wave energy along the coast that may exacerbate erosion. However, little has been done to quantify the value of using offshore sediment versus nearshore. Quantifying this value is not only important to coastal managers implementing restoration programs, but also because BOEM must consider the socioeconomic and environmental value of OCS sediment resources when evaluating impacts of other OCS activities such as: oil and gas development that might permanently obstruct access to surficial mineral deposits or competitive leasing of the same sand, gravel, and shell resources under OCSLA Section 8(k) for the aggregate industry.

Total BOEM Cost: $423,673 **Period of Performance:** FY 2015–2018
Total Non-Federal Contributions (LSU, UNO, and MSU): $430,877

Conducting Organization(s): Louisiana State University (LSU), University of New Orleans (UNO), Mississippi State University (MSU), BOEM

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Description:
Background: Loss of sand from the Nation's beaches, dunes, and barrier islands is a serious problem that affects both the coastal environment and the economy. In order to address this need, beach nourishment, shore protection, and wetlands

restoration projects are becoming increasingly routine. These sediment-starved coastal systems require compatible sand, silt, and clay material as inputs. Since 1994, BOEM has conveyed rights to over 77 million yds^3 of OCS sand for 42 coastal restoration projects in six states. These projects have resulted in the restoration of over 230 miles of the Nation's coastline, protecting billions of dollars of infrastructure as well as important ecological habitat.

Coastal land loss in Louisiana is an ongoing threat to the people and industry of that region. The U.S. Geological Survey (USGS) determined that Louisiana has lost 25% of its land area since 1932. In Louisiana, sediment suitability and availability have constrained larger scale rapid land building projects in the past. However, funds recently directed to addressing Louisiana's coastal crisis allow for a more systematic approach to land loss that involves regional sediment management. There is a need for large quantities (> 100 million yds^3) of sediment for coastal restoration in Louisiana over the next 50 years.

Two categories of restoration projects in Louisiana's portfolio which result in almost immediate land gains—barrier island/headland restoration and marsh creation—require dredged sand, silt, and clay material as inputs. Barrier island/ headland restoration projects create and restore dune, beach, and back barrier marsh to restore or augment Louisiana's offshore barrier islands and headlands. Marsh creation projects involve the creation of new wetlands in open water areas—including bays, ponds, and canals.

Within the 2012 Coastal Master Plan over $22 billion (of the $50 billion) will be needed to fund those restoration projects requiring mechanical sediment inputs. Sediment borrow distance to placement area is a limiting factor in terms of transportation costs, but because of weather and working conditions, distance is particularly salient for barrier island projects using offshore sand. Mechanical dredging, transport, and placement of compatible sediment is costly. Using OCS sand adds even more to the project cost because of increased transport distance and specialized equipment for offshore work. In coastal Louisiana, nearshore or inshore sand, silt, and clay material are a component of the sediment-starved system that is being restored requiring out-of-system sediment to be introduced to address the root cause of coastal land loss.

OCS sand resources provide the needed out-of-system benefits to managing the root cause of barrier island degradation in Louisiana: a deficit in the coastal sand budget. However, as discussed above, the construction costs of using OCS sand versus nearshore sand are higher and until 2012 nearshore sand resources were usually selected over more distal resources because of project construction costs. However, using nearshore resources from within the system fails to supplement the deficit in the coastal sand budget and frequently results in accelerated coastal erosion outside of the project area because: 1) nearshore excavations can interrupt natural sand transport pathways, trapping sand that would otherwise naturally nourish downdrift shorelines and 2) nearshore excavations can alter wave climate and produce local erosion "hot spots". Additionally, along most of the Louisiana barrier shorelines the

nearshore sand is of lower quality (higher mud content) than OCS resources which affects project performance over the long term.

Objectives: The goal of this study is to improve understanding and quantify the economic, ecologic, and geomorphic benefits and costs of using OCS vs. nearshore sediment for coastal restoration on the basis of: 1) sediment textural properties, 2) value of supplementing the coastal sediment budget, and 3) capital required to employ various construction methods.

Methods: This study will analyze both the economic and geomorphic long-term benefits and costs of using OCS sediment vs. in-system borrow for coastal restoration projects in Louisiana. The geomorphic analysis will examine available project data and develop predictive models to simulate various restoration scenarios. The economic analysis will employ results of the geomorphic analysis to evaluate benefits and costs.

Geomorphic Analysis:

- Analyze and compare quality and suitability of in-system borrow vs. OCS sediment.
- Analyze wave climate and erosion impacts of dredging closer to shore.
- Analyze benefits of supplementing the regional sediment budget.
- Analyze and compare outcomes of completed restoration projects using existing projects and modelling 4 restoration scenarios over 20 years.

Economic Analysis: Building upon the results of the geomorphic analysis, the P.I.'s will develop a comparative assessment of using in-system borrow and OCS sediment resources for coastal land-building. Specific objectives include: 1) estimating generic models of costs and benefits by sediment sources/suitability for project type; 2) conducting sensitivity analyses with varying degrees of risk; and, 3) performing case-studies to illustrate economic tradeoffs between and within sediment sources.

The PI's will compare the $/acre and $/Cubic Yards of borrow of restoration projects using in-system borrow sources vs. OCS sediment resources. The cost for delivery of physical quantities of borrow ($/acre and $/cy) will be estimated using the full funded costs of a project, which should include variables including, but not limited to, project management, mobilization/demobilization costs, distance, dredging quantity, containment, shaping, and vegetation.

Current Status: Preliminary results of the geomorphic modeling exercise are being used to develop the economic models based on island area predictions over a 50 year analysis period. Benefits trajectories for the various scenarios have been developed. A rigorous physical morphological evolution model has been developed and validated to provide realistic inputs into the economic models and is currently being run for a conceptual barrier island system that included multiple islands separated by tidal inlets. Various island restoration scenarios are being modeled over 50 years and indirect impacts to the system are being tracked.

Final Report Due: August 30, 2018

Publications Completed: N/A

Affiliated WWW Sites: N/A

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