Coastal Region Resiliency Analysis and Decision Support for Capacity Strengthening

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Background/Objectives. Resiliency of the nation's coastal economic resources is threatened by the effects of climate change. Some of the issues due to climate change include rising sea levels and the impact from stronger and more frequent storms. Compounding these effects are that many coastal areas rely on groundwater extraction or are involved in oil production which is experiencing subsidence of the ground level elevation. This subsidence worsens the climate change effects not only because the land elevations become lower and hence more vulnerable to sea level rise, but also as the land drainage configuration and slopes change, the infrastructure that relies on gravity drainage becomes less able to transmit water, likely resulting in increased magnitude and extent of future flooding. This trifecta of conditions, higher sea levels, lower land elevation, and reduced drainage slopes can cause increased risk to infrastructure and higher expected economic loss.

Approach/Activities. HGL participated as part of a Community Resilience Team that performed a Resilience Impact Assessment for Lafourche Parish, Louisiana with these issues in mind. A key activity in this Parish is Port Fourchon, a land base for Louisiana Offshore Oil Port (LOOP), which handles 10 to 15% of the nation's domestic oil, 10 to 15% of the nation's foreign oil, and is connected to 50% of US refining capacity. Over 250 companies utilize as a base of operation and maintaining this is a critical part of economic security. The risk of the port operations and the community to the above climate change conditions was apparent.
First, the general operation of the Parish was evaluated for Social Resilience, Economic Resilience and Resilient Governance to provide a baseline. Then, three candidate projects that were under consideration to help strengthen the parish were evaluated: 1) the Louisiana Highway 1 Elevation Project, 2) the Workforce Housing Study Project, and 3) the Central Parish Bayou Lafourche Cultural Trail Project. Each project was reviewed against the indicators of Social Resilience, Economic Resilience and Resilient Governance and then compared to baseline. The Team used a comparison process to reach consensus as to whether Parish practices strengthened resilience, provided a foundation for opportunities to improve resilience, or weakened resilience by consuming resources but have little impact on resilience.

Results/Lessons Learned. The Community Resilience Team finds that Lafourche Parish demonstrates strong Government Resilience, has considerable strengths to draw upon in the Social Resilience arena, and is most vulnerable in Economic Resilience. Ideas that were discussed by the Team included building elevated monorails for transport and utility lines, concurrently modeling the region's performance to future expected climate change conditions including sea level rise, land subsidence, differential settlement and its impact on infrastructure, reduced ability for water and sewage drainage, simulating the increased flooding of roadways and quantifying increased frequency of impassibility and using this information to develop an optimal robust infrastructure design using numerical models and computational optimization tools which incorporate these analyses, including risk-based uncertainty and addressing spatial temporal rates of subsidence. The summary of the results of the Resilience Impact of the Louisiana Highway 1 Elevation Project, Resilience Impact of the Workforce Housing Study Project, and the Resilience Impact of the Central Parish Bayou Lafourche Cultural Trail Project will be provided and discussed.