

## **Implementing Adaptation – Developing Land-Use Regulation and Infrastructure Policy to Implement Great Lakes Shoreland Area Management Plans**

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This research will leverage work that is wrapping up under the direction of the academic co-investigators with support from the UM Water Center, the MI Coastal Zone Management Program, and several foundations. The purpose of that work, conducted in collaboration with the non-profit planning firm LIAA, has been to develop technical methods and planning techniques designed to improve efforts by Great Lakes coastal localities in Michigan to analyze and incorporate information regarding Great Lakes shoreline dynamics into their local master plans and shoreland area management plans. This topic is especially timely in light of a Great Lakes shoreline hazard study currently being conducted by the U.S. Federal Emergency Management Agency (FEMA), which will require technical insight and methodological guidance to fully leverage. This larger project has involved, in addition to LIAA, the participation of researchers from UM's Taubman College and School of Natural Resources and Environment.

This ongoing work addresses specifically the topics of Great Lakes shoreline dynamics (focusing on dynamics related to lake level variation), near-shore environmental/natural resources analysis, near-shore land use and critical facilities analysis, fiscal impact analysis, and methods for visualizing shoreline dynamics. We have collaborated actively with the Lake Michigan communities of Ludington, Grand Haven, and St. Joseph. Working with these communities, we have developed technical and planning methods to incorporate these kinds of analyses into local planning efforts and to evaluate the usefulness of those methods in application. We have also provided technical analyses to Macomb County and localities along Lake St. Clair. For all of these analyses, we have prepared scenario-based planning approaches for accounting for uncertainty in future climate conditions and evaluating the advantages and disadvantages of potential arrays of local shoreland area management options.

While the focus of our work has been on developing shoreland area planning methodologies for use by coastal localities around the Great Lakes, we have not yet developed methods for actually implementing local master plans or shoreland area management plans. These kinds of plans are typically implemented through the adoption of local land use regulations, such as zoning codes, and infrastructure policies, such urban service boundaries for the provision of water and sewer. Both of those implementation mechanisms typically involve substantial additional analysis and investment beyond the adoption of the master plan. The work we propose through this Integrated Assessment will be to continue our collaboration with the City of Grand Haven and Grand Haven Charter Township to assess the issues and needs related to the development and adoption of regulations and policies that are needed to implement their local plans in order to improve shoreland area management in the face of dynamic Great Lakes water levels.