



Florida Department of Transportation Research

Development of a Geographic Information System (GIS) Tool for the Preliminary Assessment of the Effects of Predicted Sea Level and Tidal Change on Transportation Infrastructure, BDK75 977-63

The longest record of sea levels in the Western Hemisphere began in 1846 in Key West, Florida. It shows a steady and gradually accelerating sea level rise (SLR) – nine inches since 1900. The increasing rate of recent years has implications for Florida, with its long coastline, hurricane history, and low-lying coastal zones, and as a major infrastructure builder and manager, the Florida Department of Transportation (FDOT) must understand possible impacts of SLR on the state's transportation system.

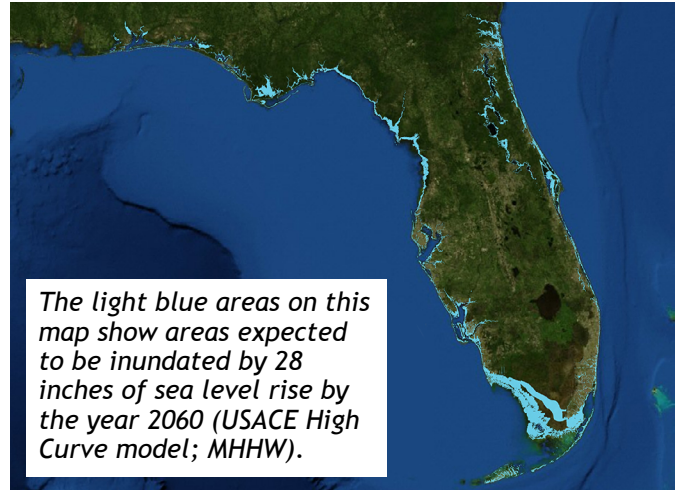
In this project, University of Florida researchers developed a sketch planning tool to assess the vulnerability of transportation facilities to SLR, building on previous FDOT-sponsored research (BDK79 977-01; 2012). That project recommended two short-term actions: (1) Apply the U.S. Army Corps of Engineers (USACE) methodology to develop statewide and regional projections of SLR; and (2) Develop a sketch planning tool to identify potentially vulnerable infrastructure. These actions are addressed in this project.

The researchers' objective was to construct an interactive framework incorporating various GIS data, such as elevation data, tide gauge data, and some FDOT repositories: Roadway Characteristics Inventory (RCI), Strategic Intermodal System (SIS), and Unified Basemap Repository (UBR). Together, this information could produce inundation maps.

The sketch planning tool, which provides a preliminary identification of at-risk facilities, was created using ESRI ArcGIS. The tool comprises three tools which accommodate varying expertise: a Map Viewer, GIS data layers, and a Sea Level Change Inundation Surface Calculator.

Based on parameters such as SLR projection scenarios (low, intermediate, and high), time period (decadal from 2040 to 2100), and two tidal datums (Mean Sea Level (MSL) and Mean Higher High Water (MHHW)), the Map Viewer displays SLR inundation maps and affected transportation infrastructure.

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The Map Viewer can export tabular data for affected infrastructure to Excel or similar programs. The Map Viewer needs no special software, only an Internet connection and Web browser. Experienced GIS users can download inundation and affected infrastructure data layers from the project website (sls.geoplan.ufl.edu). These can be overlaid with others, such as local infrastructure, transit, and floodplains. Advanced GIS users can use the Sea Level Change Inundation Surface Calculator to create custom inundation surfaces, choosing a Florida tide station, a USACE projection scenario, decade, tidal datum, and digital elevation map (DEM).

The Florida Sea Level Scenario Sketch Planning Tool includes statewide and regional data: SLR projections, a 5-meter horizontal resolution DEM, inundation surfaces, and various transportation layers from the FDOT repositories. The 5-meter resolution does not provide local and site-specific features such as roadway and bridge elevations, gullies, ditches, dikes, levees, and culverts. Though the selection procedure and small scale of analysis may overestimate affected infrastructure, the sketch planning tool is valuable for planners and engineers who need preliminary assessments of the SLR impacts under various scenarios.