US Army Corps of Engineers

IWR

Institute for Water Resources

Communications Update

On the Web:
http://www.iwr.usace.army.mil

For More Information:
+1 (703) 428-9090

August 13, 2014

Procedures to Evaluate Sea Level Change: Impacts, Responses and Adaptation

ALEXANDRIA, VA — U.S. Army Corps of Engineers (USACE) missions, operations, programs and projects must be resilient to coastal climate change effects, beginning with sea level change. USACE has developed a robust approach to sea level change that is flexible enough to incorporate new knowledge and changing conditions. USACE is responsible for a very large and diverse population of water resources projects that range from small, low-impact projects to very large, system-wide projects covering the applicable timeframe from 1850 to 2100 in construction and life cycle. In addition, the vastly differing capacity and loading conditions along U.S. coastlines extending from Alaska to Louisiana complicate the process of understanding and responding to a changing environment.

Initial guidance was issued in 2009 through the Engineering Circular, *Incorporating Sea Level Change Considerations in Civil Works Programs*, EC 1165-2-211. That Engineering Circular was updated in 2011 with EC 1165-2-212 and later superseded by ER 1100-2-8162, *Incorporating Sea Level Change Considerations in Civil Works Programs*, in 2013. The latest guidance document in this effort is a technical letter, ETL 1100-2-1, *Procedures to Evaluate Sea Level Change: Impacts, Responses, and Adaptation*, which explains how USACE staff will account for the direct and indirect physical and ecological effects of projected future sea level change on USACE projects and systems of projects, including considerations for adapting to those effects.

This ETL provides guidance for USACE staff on how they will plan and implement adaptation to changing sea levels for every USACE coastal activity as far inland as the extent of estimated tidal influence. The extent of tidal influence on an estuary or river is controlled by the geography of the area and the hydraulics of the system (e.g., despite its size, all of Chesapeake Bay is influenced by tidal forces in some manner). While the tidal influence diminishes with distance and elevation gain from the generating source, it can extend many miles upstream. The ETL presents a broadly applicable method with special attention to four USACE mission areas (Flood Damage Risk Reduction, Coastal Storm Damage Reduction, Navigation, Ecosystems) as well as insight into application to multipurpose projects. The information presented in the technical letter is applicable to the full range of USACE projects and systems, from simple to complex, from small to very large, and over the full life cycle.

The procedure recommends three sea level change curves for use ranging from the extrapolated historical sea level trend to a higher curve that incorporates additional ocean warming and ice melt. The tiered approach acknowledges the potential significant impacts of extremes, and cumulative and system effects. USACE is encouraging the movement away from designing and evaluating projects in isolation and instead considering projects from a system perspective. Emphasis is placed both on how the project operates within a larger system as well as how project decisions now can influence future impacts. An essential task is to identify key elevations, weak links and thresholds in the system. With changing loading conditions throughout the project lifetime, the identification of a wide array of possible thresholds and tipping points (both physical and social) can affect the actual project performance and alternative acceptability.

Considering potential loading and performance changes throughout the project timeline allows the identification of measures or combinations of measures adaptable to those changes.

The guidance requires USACE staff to use a tiered assessment that is guided by a hierarchy of screening levels with various review and decision points to identify the level of analysis required as a function of project type, planning horizon and potential consequences. The review and decision points in the hierarchy require engineers and planners to reassess the required data and update the analysis approach. The three tiers include: (1) establishing a strategic decision context, (2) determining project area exposure and vulnerability, and (3) developing and evaluating alternatives for addressing sea level change at the project site. The technical letter approach scales the level of effort with respect to sea level change to the consequences of getting the answer wrong in an ever challenging funding and execution climate. The goal of this approach is to provide a method to develop practical, nationally consistent, legally justifiable, and cost effective measures, both structural and nonstructural, to reduce vulnerabilities and improve the resilience of our water resources infrastructure to sea level change.

Learn More

For more information, visit www.iwr.usace.army.mil.