US Army Corps of Engineers®
Engineer Research and Development Center

Risk Analysis of Coastal Structures

Description

The goal of this research is to develop engineering methods and PC-based tools to facilitate standardized risk-based analyses of coastal structures. Engineering techniques for coastal structures historically have been based on empirical design equations intended for use with a single design-level storm. Thus, prior to this effort, long-term damage prediction equations did not exist for coastal structures.

Issue

The Corps manages roughly 1000 coastal structures. The majority of these structures have exceeded their design life and most have been repaired multiple times. Approximately 85 percent of the structures are traditional rubble mound. Many of these structures have deteriorated but apparently are still functioning adequately. In order to evaluate the condition and functionality of these aging structures using objective techniques, the OMB and Corps mandate that risk methods be used for all major studies. Unfortunately, there are presently few standards or tools for coastal engineering risk and life-cycle analysis.

Users

Corps coastal engineers and all others involved in the design of or budgeting for coastal structures.

Products

New time-dependent damage models for rubble mound structures have been developed. Also, new time-dependent wave and water level simulation methods and functional economic analysis methods are being developed. These equations and methods are being incorporated into new PC-based computer programs for life-cycle analysis of coastal rubble mounds. A new suite of PC programs is being developed in conjunction with the Institute for Water Resources to provide a variety of tools for life-cycle analysis and optimization of coastal structures. In addition, Boussinesq and Reynolds-Averaged Navier-Stokes equation numerical models are being validated for a variety of coastal structure applications. The programs are being modified and then used to develop comprehensive and generalized lookup tables of coastal structure response such as wave runup, overtopping, transmission, and diffraction for use in the PC risk-based programs. Other products will include technical reports, peer-reviewed conference and journal articles, workshops at conferences and Corps Districts, and PC programs.

Benefits

Having a tools for coastal engineering risk and live-cycle analysis available for the design of both new structures and repairs, as well as for the budgeting of those efforts, will provide cost and time savings.

Corps Program

Navigation Systems Research Program, Mr. Charles E. “Eddie” Wiggins, Program Manager.

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Partners

USACE Coastal & Hydraulics Laboratory; USACE Institute for Water Resources; Texas A&M University; and University of Delaware. PIANC working group 47 is also integrated with this effort.