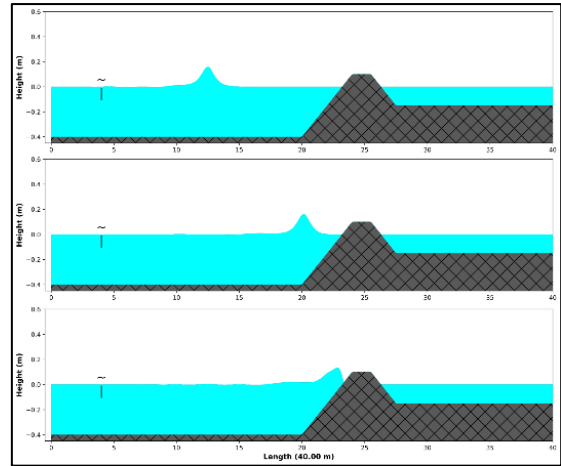




## Rapid Screening of Coastal Structures (FY21)

**Background:** Wave-structure interaction and general wave-driven processes are very complex and can occur across multiple temporal and spatial scales. Accurate and robust quantification of reflection, absorption, and transmission wave properties in mixed coastal domains is a ubiquitous problem. From a practical perspective, there is a pressing need to modernize outdated coastal design practices, guidance, and documentation that rely on simplified empirically-derived design curves from the 1980s. These design curves do not adequately represent the full spectrum of wave reflection, runup, overtopping, and transmission response with a coastal structure in an irregular, highly-nonlinear wave field. Even though many of these empirical formulas are still widely applicable, they rarely are validated against numerical models for operational use.



**Approach:** This project will directly address the need to integrate high-fidelity Boussinesq-type modeling of wave transformation, interaction, and response with a range of coastal structure properties. Using the fully nonlinear phase-resolving numerical wave model FUNWAVE-TVD, we will focus initially on a single trapezoidal breakwater in one- and two-dimensions.

### Technical Advancements:

- Enhance coastal engineering practices from planning to design using rapid, robust screening solutions in early stages, at a fraction of the full-modeling cost and effort, with short turnaround time.
- Provide database of deterministic guidance of wave responses (reflection, absorption, runup, overtopping, and transmission) over range of coastal structure designs and wave climate properties.
- Advance development and benchmarking of FUNWAVE-TVD to a wide range of coastal District projects.

**Payoff:** Providing coastal planners and engineers with deterministic guidance of wave-structure interaction responses will facilitate rapid screening of design alternatives for efficient and effective decision-making under environmental uncertainty. Rapid screening using Boussinesq-type wave models will ultimately save time, money, and resources for planners and programs, tasked with executing new constructions, as well as maintenance and rehabilitation of existing infrastructure. District Engineers will have access to this guidance via the comprehensive FUNWAVE Wiki for planning and feasibility studies that require advanced wave modeling for new or existing structures. This guidance will directly support Navigation and Flood Risk Management business lines.

### ERDC Points of Contact:

Marissa J. Torres, Principle Investigator  
Tanya M. Beck, Program Manager

[CIRP@usace.army.mil](mailto:CIRP@usace.army.mil)  
Coastal Inlets Research Program  
<https://cirp.usace.army.mil>

