



**US Army Corps
of Engineers®**
Engineer Research and
Development Center

Navigation Systems Research Program

Description of Research

The Navigation Systems Research Program, administered by the [Coastal and Hydraulics Laboratory](#), develops integrated tools and methods to aid in the planning, design, construction, and management of present and future ports and waterways. The research seeks to create effective solutions in perspective with the multiple demands, requirements, and constraints of real-world commodity transport and power production prob-



Ice Harbor Lock and Dam on Snake River, Southeast Washington

lems. This involves the integration of several disciplines including water dynamics, infrastructure mechanics, advanced materials, power physics, economics, innovative construction, coastal and riverine processes, automated control and monitoring, remote sensing, operations research, stochastic processes and emerging technologies, among others. Research is organized into four focus areas – deep-draft navigation, inland navigation, hydropower, and navigation networks and asset management.

Expected Products

Research products fully integrate environmental, economic, and engineering aspects to improve the performance of the marine transportation infrastructure. Products support business line performance measures, meet environmental compliance requirements, improve life-cycle project management, exploit existing and proposed spatial tools, and incorporate a risk-analysis framework for investment decision support. Recent products include tools for computing life-cycle costs of coastal structures, predicting risk-based scour amounts and repair costs, improved estimates of barge impacts loads on lock approach walls, state-of-the-art 3-D hydrodynamic software for improved design of inland coastal navigation structures, guidance for reducing fatigue cracking of welded joints in lock miter gates, and real-time current measurements at navigation locks to help tow pilots enter locks with increased safety.

Potential Users

Needs and opportunities are identified through the navigation business line team, communities of practice, USACE centers of expertise, regional business centers, USACE Districts, and stakeholders, who are among the primary users.

Projected Benefits

Research efforts target navigation channels, locks, jetties, breakwaters, dams, and power plants to optimize among life-cycle and reliability trade-offs, ensure defensible economic assessment, and provide better investment decision tools for predicting performance and deterioration with time, and scheduling and prioritizing maintenance and repairs balanced with the consequences of delays. [Navigation Economic Technologies \(NETS\)](#) operates within the program to develop independently verified economic models, tools, and techniques in support of the Corps' commitment to determining the navigation projects that provide the best value for the dollar.

Program Manager(s)

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Participating ERDC Laboratories

Coastal and Hydraulics Laboratory, Information Technology Laboratory, Geotechnical and Structures Laboratory, Cold Regions Research and Engineering Laboratory, and Construction Engineering Research Laboratory.