

**Environmental Security Technology Certification Program (ESTCP)**

**DEPARTMENT OF DEFENSE (DOD) INFRASTRUCTURE RESILIENCY  
ARCTIC ENGINEERING DESIGN TOOL**

**OBJECTIVE**

Demonstration projects are sought to address engineering design support needs for Arctic infrastructure. Specifically, a decision support tool is needed that provides engineers and planners with state-of-the-art information for infrastructure planning and design in the dynamic Arctic environment. The decision support tool should provide output data in several formats that include the range of variability, trends, extremes, and the statistical distribution of specific variables.

Proposed projects should demonstrate capabilities to provide:

- The entire suite of data and information needed to plan and estimate life cycle costs for infrastructure including design, construction, maintenance, and reclamation (e.g. roads, bridges, culverts, buildings and industrial facilities, airports, ports, etc.);
- Information about projected environmental conditions and a plan to update and replace the hardcopy Environmental Atlas of Alaska (1984), the Cold Region Utilities Monograph (1996) and similar arctic decision reference materials that are either no longer available, or are out of date, particularly in light of rapid environmental change in the Arctic.

**BACKGROUND**

The ESTCP Resource Conservation and Resiliency Program Area supports the DoD mission by demonstrating and validating innovative and cost-effective technologies that enhance DoD capabilities that rely on training lands, cantonment areas, test stands, and many other types of installation facilities and built infrastructure.

In the Arctic, infrastructure developers currently use data that are outdated, sparse, and do not include state-of-the-art measurements. To account for dynamic environmental change during the life expectancy of a given project, Arctic Engineers also need access to projections of changes in extremes of temperature, precipitation, sea level, hydrography, and other pertinent environmental factors. Information of this nature and quality is essential for planning and assessing the vulnerability of infrastructure that provides operational mobility and transportation. In addition to infrastructure adaptability to a changing environment, decisions need to balance cost-effectiveness and ensure that infrastructure fulfills its purpose and can withstand its dictated lifespan. As a result, new tools are sought to provide data using a probabilistic approach to risk that is adjustable based on cost and changing operating conditions. In some locations, road and infrastructure developers may lack data altogether so the engineering design support tool would need to have the capability to provide information about expected environmental conditions drawn from all sources.

All proposed tools must provide dynamically downscaled data and projections that represent current and future arctic conditions; the ability to easily calculate mean, trends, and other statistics for locations and regions; easy integration of climate and environmental variables into engineering

design parameters such as load-bearing capacity; and decision-support tools for synthesizing design and engineering risk. Capability for both scenario based design that compares historic to future conditions and explicit model design should be provided along with visualization capabilities and the inclusion of an analysis and communication of uncertainty. The tool should also provide the user transparency in regard to estimates of uncertainty associated with the environmental factors for which the tool is designed where transparency means insight into the source of the data or models used, scenario divergence, model uncertainty, observation uncertainty, and climate variability. The proposed tool may have links to different data sources that possess all of the attributes required to support the required analysis, but the user should be able to select and understand the available data.

Preference will be given to proposals that describes a robust pathway for the transition and future sustainment of the proposed decision tool beyond the duration of the project.

### **POINT OF CONTACT**

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For pre-proposal submission due dates, instructions, and additional solicitation information, visit the [ESTCP website](#).