

Project Title: Dredging projects selection when the random shoaling effect is considered
Project Abstract (Brief Description): Dredging is a constant operation to maintain the waterway shipping capacity along the rivers, coastal lines as well as ports and harbors. The goal is to achieve a maximum network capacity to support the regional and national economies within the range of a given budget. Shoaling happens after dredging to partially offset or undermine the dredging benefits. Wisely spending the dredging budget for a network capacity by considering the shoaling effect is the objective of this proposed research. This proposal assumes shoaling at each location/section follows a known probability distribution with a given draft. It will build on earlier models and algorithms developed by the research team to propose optimality based stochastic model and algorithms for this particular problem, which specially considers interdependency of project effects on the network. This project expects to complement other researchers' earlier work that adopts discrete scenario based optimization method through simulation.
Describe Implementation of Research Outcomes: The study specifically optimizes the selection and funding of the maintenance projects by considering budget limit, system randomness (e.g., shoaling), and network connectivity with an objective to reduce the overall multimodal network shipping cost. Two notable features of this paper include establishing a model that considers the interdependence of maintenance projects in terms of realizing their network benefits and the shoaling effect. The method of dealing with random shoaling in this paper is through approximation using a deterministic model. Lock and dam maintenance projects are complicated to consider in the network flow model, but this paper makes a first step towards incorporating it. The numerical test uses the Ohio River Basin network, whose historical Waterborne Commerce data and historical annual tonnage data is provided by the USACE.
Impacts/Benefits of Implementation: The proposed model effectively makes meaningful recommendations regarding the maintenance project funding. The MIP model proposed in this paper represents a much-needed effort to facilitate the system wide decision making in the context of multimodal transportation. Many interesting research topics may ensue by building on the MIP model here. Additionally, the random shoaling may warrant further studies by considering the correlation with dredging between segments.
Web Links: martrec.uark.edu
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