Modeling CBRN Hazards in Rivers and Estuaries

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While assessing the threat of chemical, biological, radiological, and nuclear (CBRN) agents in the atmosphere is important, assessing the threat of CBRN hazards in waterways, including ports, is also critical to national security. Oak Ridge National Laboratory (ORNL) has been tasked to develop a suite of water transport models for threat evaluation and emergency response applications. These models will predict the fate and transport of CBRN agents that are introduced to waterways from both terrorist activities and accidental releases. The suite will range from screening-level to high-fidelity models. Applications will include emergency planning, emergency response, and recovery planning. The model selected for each type of application will depend on both the speed with which an answer is required and the amount of data available. Our current model, HYTRAS/CH1D has screening-to-midrange accuracy. It will predict the concentrations of CBRN agents in rivers and estuaries in both the water and the sediment. Both point and run-off sources are modeled. Processes modeled include radioactive decay, volatilization, adsorption/desorption, sedimentation, settling, and resuspension. Biodegradation, photolysis, and any other process that can be modeled using a first-order decay constant can be included. Ongoing work includes creating methods to estimate the source of any CBRN agent found in a river or estuary and to develop 2D and 3D models of estuaries.

To ensure that these models are as useful as possible, ORNL hosted a workshop to determine users' requirements for models of CBRN agent transport in waterways. The results of this workshop will be discussed briefly.