Analysis of Accident Risks in Narrow Waterways: The Case of Istanbul Channel
Supported by the National Science Foundation
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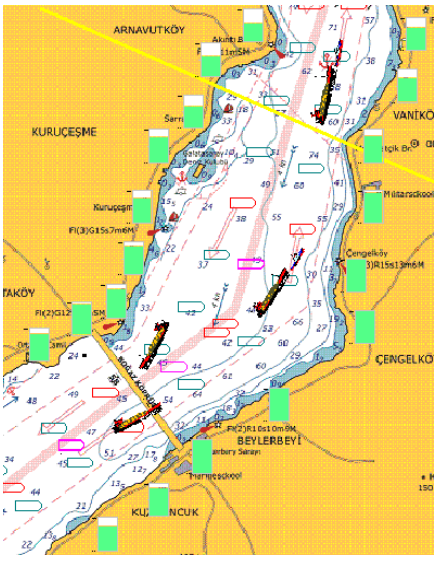
The Istanbul Strait runs across Istanbul, the largest city in Turkey with a population of 13 million people. It unites the Black Sea and the Sea of Marmara and separates Asia from Europe. As a result of its geographic location, the Istanbul Strait has a significant strategic importance. Countries in the Black Sea region depend on the Strait to exchange goods with the rest of the world. Traffic in the Strait will likely increase in the coming years as these countries develop economically. Recent oil treaties involving the Russian, Caspian and Kazakh regions are pointing towards an even further increase in traffic.

The Istanbul Strait is identified as one of the six bottleneck points for sea transport by the U.S. Energy Information Administration (EIA) due to its narrow shape and high traffic volume. Its winding contour, strong currents reaching up to eight knots, and poor visibility due to fog, snow and rain create additional risks. Approximately ten percent of 50,000 vessels, which pass through Istanbul Strait every year, are oil or liquefied natural gas tankers. This combination of factors has magnified the risk of a major accident that could have serious environmental consequences and endanger millions of residents.

In the course of this project, a detailed computer simulation model is developed for the transit vessel traffic including various classes of vessels in the Istanbul Strait. The class of a vessel is determined by its cargo and length namely tankers, LNG-LPG carriers, dangerous cargo vessels, dry cargo vessels and passenger vessels. Through our collaboration with the Turkish Vessel Traffic Services (VTS) Center, we have developed an accurate vessel scheduling algorithm following the Maritime Traffic Regulations of the Turkish Straits. The purpose here is to assist the VTS center in streamlining their daily scheduling activity.

The simulation model was built for risk analysis purposes to study the temporal behaviors of the *situational variables* and accident risks over time. The *situational variables*, which are the parameters that may impact accident risks in the Istanbul Strait, include arrival patterns of different classes of vessel, meteorological conditions, types, and quantities of the cargo in transit, and topographical characteristics of the strait.



The ultimate goal of the project is to arrive at operational policies that will mitigate the risk to the environment, Istanbul residents, and the economy while maintaining an acceptable level of vessel throughput. The project is a collaboration between Rutgers University and the Bosporus University of Istanbul who is funded by TUBITAK, the Turkish counterpart of the NSF.