Strategic and operational risk management for wintertime maritime transportation system

Summary after second reporting year

1. Brief description of the project’s overall goal and expected final results

BONUS STORMWINDS has an overall objective to enhance the safety of maritime transportation in the Baltic Sea through science-based decision support and technological developments. Focus is on wintertime conditions in the Northern Baltic Sea, with strong links to regional policies, stakeholder concerns and practical end-user needs. The work addresses three key research themes: “risk management for oil spill response”, “Systems-theoretic analyses of the maritime transportation system” and “e-Navigation and smart response services”.

2. Work performed since the beginning of the project

**Research theme “Risk management for wintertime oil spill response”**

The work concerning the strategic risk management is the identification of the risk management modelling approach, the development of a conceptual approach for building the model, the definition of an approach for communicating the strength-of-evidence and further uncertainty about the risk model results. Furthermore, several analyses were performed to build elements of the evidence base as support of the oil pollution risk and response fleet performance model. These include an analysis of the characteristics of wintertime navigational accidents, analysis of the main particulars and spill-size relevant design characteristics of vessels operating in this area, study of operational characteristics of ship convoys in ice conditions, model development and analyses for collision damage scenarios in winter navigation accidents, climate scenario analyses focusing on the future ice cover extent, and modelling of oil spill recovery effectiveness in ice conditions.

**Research theme “Systems-theoretic analyses of the maritime transportation system”**

The work has focused on the definition of a new STAMP-Mar framework (Systems Theoretic Accident Model and Process), which is a novel approach to link the application of systems-theoretic approach to maritime domain, linking the safety management of a sustainable eco-socio-technical maritime transportation system with maritime spatial planning processes. Its aim is to enhance safety performance in light of the multiple uses of the maritime space.

Work has also focused on defining a process for establishing a safety management system of maritime transportation organizations, including a method to extract Key Performance Indicators (KPIs) from maritime safety management regulations and organizational system functions. The practical work of analysing the Vessel Traffic Service (VTS) activities has been completed, and a safety management tool has been developed. Work has started on defining a process for validating the developed safety management system and tool.
Research theme “e-Navigation and smart response services”

The work on e-Navigation has focused on the establishment of an integrated database combining data from the Automatic Identification System (AIS) with ice data. This database has been used for developing a hybrid model for ship performance in ice, suitable for route planning in sea ice environments.

Work has also addressed the development of smart response services. Here, advanced analyses have been made to study the effect of ice presence on the impact energy in collision accidents, and a model for oil outflow in winter conditions has been developed. In addition, a web-based simulation tool for estimating the volume of oil spilled in a collision/grounding accident is under construction. Work is also underway to integrate this tool to Seatrack Web, a tool for estimating the oil spreading in the sea area, including an interface to Geographic Information System (GIS) layers showing the ecological shoreline value.

3. Main results achieved during the reporting period, including potential impact and use envisaged by the results noted

The main results achieved so far include a database of wintertime navigational accidents, an analysis of climate change effects in the Northern Baltic Sea relevant to shipping, a proposed framework ‘STAMP-Mar’ for a safety analysis of the vessel control and response processes, a process for developing and a tool for safety management systems of a maritime system, an extensive AIS-ice database, a model for collision energy in ice conditions, a model for oil outflow in ice conditions, a hybrid model for ship performance in ice to be linked with a route planning tool, several publications in leading scientific journals and multiple presentations in scientific and policy-relevant environments.

The results achieved so far thus pave the way for meeting the overall STORMWINDS objectives. While the analyses of the risk management of oil spill response and the systems-theoretic analysis of the maritime transportation will primarily impact the performance and decision-making processes of relevant authorities, the e-Navigation and smart response services are envisaged to have socio-economic impact through offering new commercially relevant services. However, only prototypes of these services will be produced as output of the project. Ultimately, these services will contribute to ensuring the sustainable use of the Baltic Sea in relation to relevant ecosystem services. The significance of the work done in STORMWINDS is evidenced as the project has been selected as a Flagship project of the EU Strategy for the Baltic Sea Region, Policy Area SAFE, in which it contributes to reducing the environmental impact of shipping, reinforcing the preparedness and response capacity, and developing new e-Navigation tools.

For more detailed information on BONUS STORMWINDS, up-to-date information on project output, and project activities and initiatives, please visit us at www.stormwinds.aalto.fi.

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