Publishable Summary of the ESABALT Periodic Report P1

Project acronym	ESABALT
Project title	Enhanced Situational Awareness for Improved Maritime Safety in the Baltic Sea
Period covered	1st March, 2014 – 28th February, 2016
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1   Project Context and Objectives

Enhanced Situational Awareness to Improve Maritime Safety in the Baltic (ESABALT) is an R&D project funded by the BONUS program. The primary goal of ESABALT is to study the feasibility of implementing a software platform for maritime situational awareness through vessel-driven and user-driven autonomous information crowdsourcing techniques in order to enable cross-border cross-sector cooperation, and therefore enhanced maritime safety, security, environmental monitoring and emergency response in the entire Baltic Sea region. ESABALT aims to integrate latest technological advances in sensing, positioning, e-Navigation, Earth observation systems, and multi-channel cooperative communications. Three specialized services will be studied: intelligent marine navigation and routing information, efficient emergency response, and environmental monitoring and reporting with emphasis on cross-border cross-sector functionality. Partners in the ESABALT consortium include the Finnish Geospatial Research Institute, Furuno Finland Oy, SSPA Sweden, and Maritime University of Szczecin, Poland.

2   Work performed and Main Results Achieved

DELIVERABLES - During the first reporting period, ESABALT has successfully implemented:
- WP1 (ESABALT System Overview and Concept Refinement),
- WP2 (User/Stakeholders overview and Requirements Specification), and
- WP4 (System Architecture Definition and Associated Services Specification).

WP1 - During this WP, the following results were achieved:
- Refined the ESABALT concept from its initial formulation. ESABALT is envisioned as a distributed network in which different user and data-source groups are connected via the internet,
- Different types of terminals have been considered, e.g. pleasure boats, commercial vessels, authority vessels, as well as sea and land based sensor stations, and the onshore control center,
- Different associated services were refined: (1) intelligent marine navigation and routing, (2) efficient emergency response, and (3) environmental monitoring and reporting, with emphasis on cross-border cross-sector functionality,
- Validated the overall concept by reaching out to the maritime community—the potential users of the ESABALT system—through an online survey to gauge the need and willingness to adopt such a system, as well as to gather general feedback on the operational needs and constraints of maritime stakeholders.

The results of the user survey generally validated the overall ESABALT concept, i.e. such a system would indeed contribute to improved maritime safety and that mariners would be willing to participate in the crowdsourcing aspects if given the technical capability.

WP2 – During this WP, the following results were achieved:
- Analysis of the potential stakeholders and users to identify the system user profiles,
- Formulation of user, system & domain requirements for detailed system specification,
- Formulation of the system assessment criteria in terms of situational awareness and maritime safety improvement. These criteria will help evaluate the system prototype in comparison to other existing devices, systems and R&D projects.

WP4 - This WP proposes a design for the ESABALT system architecture (Fig. 1). The central data and web server will process all the crowdsourced information from the individual ESABALT terminals, and in turn
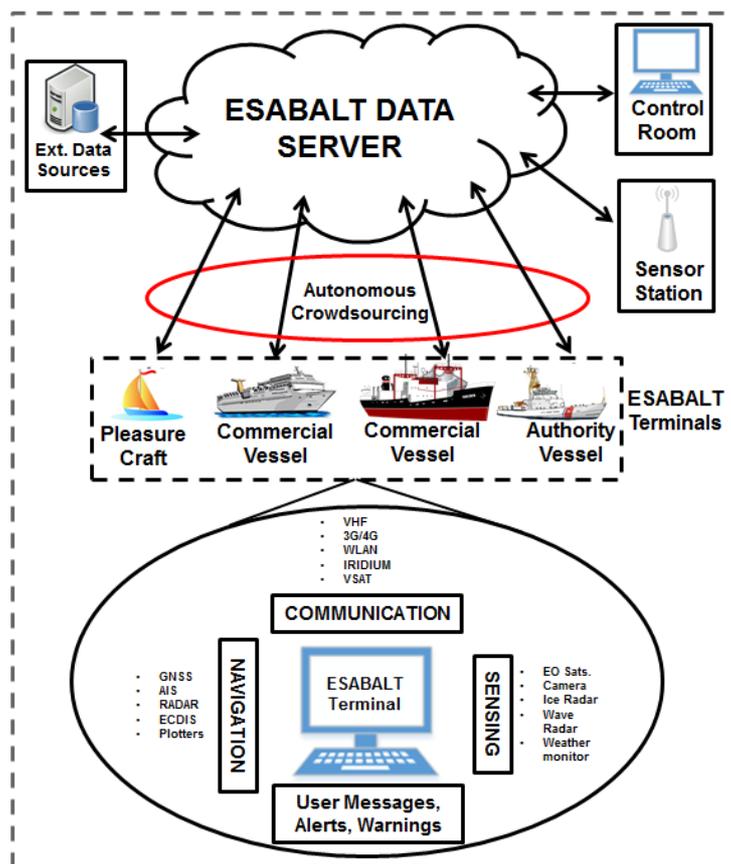
Fig 2. ESABALT System Architecture

cater to their service requests. Each terminal is supported by the three primary technology pillars – Navigation, Sensing and Communication. The land-based or sea-based sensor stations enable environmental monitoring, external databases provide maps, vessel information, and Sentinel-1 earth observation (EO) images, and a central control station manages administrative oversight. This WP also describes the concept of **'Autonomous Vessel Data-Crowdsourcing'**, which includes integration of novel sensors with the ESABALT terminals onboard the vessels or in automated sensor stations so that relevant data aggregated with other sensor/AIS information is crowdsourced to the server with minimal, if not zero human intervention. This information is available to other vessels or authorities for real-time situational awareness in the Baltic Sea Region.

OTHER MILESTONES - ESABALT has implemented the project webpage (*www.ESABALT.org*), Project Kick-off meeting, and 1st (in person) Project Status meeting.

FLAGSHIP PROJECT STATUS – ESABALT is recommended as an EU Flagship Project under the EU Strategy for the BSR (EUSBSR) Policy Area *Maritime Safety and Security* by its International Steering Committee.

PUBLICATIONS - ESABALT has a very positive publishing record in the 1st reporting period:
- Three peer-reviewed journal articles accepted to the *International Journal on Marine Navigation and Safety of Sea Transportation (TRANSNAV)*.
- Two conference papers accepted to the *2015 European Navigation Conference (ENC)* in France (awarded **Best Student Paper**) and the *2015 Institute of Navigation's GNSS+* in USA
- One article in National Land Survey's *Viisari* magazine and two articles in *BONUS bulletins*.

MARITIME TEST AND DATA COLLECTION CAMPAIGNS - onboard the VikingLine cruise ship 'Amorella' between Turku, and Stockholm. The aim was to study the operation of the maritime bridge systems, interview the crew, and collect vessel routing, communication, navigation, other sensor, and engine performance data during the voyage in the Baltic Sea. This will help understand the most critical information for maritime crowdsourcing, gaps in current technology and end-user needs.

PROJECT MEMBERS IN STAKEHOLDER COMMITTEES – Project members served in nine maritime policy meetings and stakeholder committees, enabling ESABALT to contribute in future BSR policy planning.

INTERNATIONAL STAKEHOLDER EVENT - FGI arranged the *2014 International Conference on Localization and GNSS (ICL-GNSS)* in Helsinki, Finland, targeting innovations in navigation technology.

COLLABORATION WITH OTHER INTERNATIONAL RESEARCH COMMUNITIES - international collaboration under two EuropeAid projects in matters of maritime safety and security, mariner's qualification and skills, development of new technologies, and introducing existing technologies into the maritime field.

DISSEMINATION - ESABALT achievements during the first reporting period were showcased at the:

- Kick-off meeting of the BONUS projects starting in 2014, August 2014 in Riga, Latvia.
- Geoilwatch Workshop in January 2014 in Tallinn, Estonia.
- Meeting with the Finnish Traffic Safety Authority in February, 2014 in Helsinki.
- GIS Expo (Paikkatietomarkinnat) in November 2014 in Helsinki, Finland.
- Seminar on 'Space Opportunities for Marine Industry in the Arctic', Nov.2014 in Helsinki, Finland.
- Meetings at the VTC-centre and Swedish Coast Guard command centre in Stockholm.

3   Expected Final Results and their Potential Impact and Use

ESABALT's **final goal** is to determine the feasibility and implement a proof-of-concept demonstrator of a real-time integrated software-based mechanism offering user-driven information services for optimal decision-making towards the marine environment, safety and security in the Baltic Sea area. ESABALT will differ from traditional navigation information systems, as it learns from users' navigation experiences to provide dynamic, intelligent (ice-aware, environment-aware, and accident-aware) and energy-efficient route plans, and efficient emergency response. Information can be exchanged between commercial vessels, pleasure boats, authorities and distributed sensor stations instantly, making all of them stakeholders in the improvement of the overall Baltic Sea maritime situational awareness.

The **business potential for ESABALT** comprises of all those who navigate in the Baltic, in a commercial as well as non-commercial capacity. ESABALT is planned to be free for end-users, but paid by other subscribers, such as harbors, shipping companies, and small-to-medium enterprises (SMEs) implementing innovative services and applications on top of the crowdsourced maritime data. The project will demonstrate that a trusted, independent intermediary can collect, process, and store location and other maritime data using transparent and clearly documented methods. ESABALT will also contribute towards fuel-efficient and safe shipping resulting in reduced insurance costs. Integrating pleasure boats into the data crowdsourcing will enable them to contribute to coastal surveillance and monitoring, thus reducing the burden on already resource-strapped coastal authorities. The system impact can be summarized in three categories; increased information sharing, increased number of users and aggregated information overview across national boundaries and administrative sectors.

Thus, ESABALT is strongly aligned with the **objectives of the BONUS program** especially, *Developing improved and innovative observation and data management systems, tools and methodologies for marine information needs in the Baltic Sea region.* ESABALT also contributes towards the *Save the Sea* objective of the **European Union Strategy for the Baltic Sea Region**. It directly addresses the Strategy's Policy Area *Maritime Safety and Security* (PA SAFE) in the part that focuses on the 'Reduction in the number of maritime accidents'. By delivery of current, high-quality, integrated navigation-support data the project offers specific tools for situational awareness and accident prevention thus contributing to the PA Actions *Develop co-operation in maritime surveillance and information exchange* and *Improve safety of navigation by means of e-Navigation and new technology*.