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Interreg Central Baltic EfficientFlow project as a digital STM solution for improving information exchange between ships, ports and hinterland actors

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Abstract

Efficient transport solutions play an important role for the Baltic Sea region. The management of the vessel traffic in the fairways of the area is currently done mainly by voice communication. Any unexpected event or situation inevitably cause delays and increased waiting times. Automated information exchange between ships and shore centers by introduction of new ICT tools will ensure efficient traffic flow and enhance safety of vessel traffic. Sea Traffic Management (STM) is a possible answer to the need for improved efficiency in maritime transport and will be tested between ports in Sweden and Finland. The implementing of STM will provide optimizing of the processes, interaction between stakeholders and exchange of information. New Ship and Port ICT application will connect hinterlands and ports to sea traffic and will be tested in ports of Gävle and Rauma within EfficientFlow project during 2018-2020 years.

Keywords: shipping; information exchange; sea traffic management; maritime logistics; safety.

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1.1.1. Abbreviations

ICT	information and communication technology
STM	Sea Traffic Management
IMO	International Maritime Organization
EUSBSR	EU Strategy for the Baltic Sea Region
PA SAFE	Policy Area Maritime Safety and Security
SESAR	Single European Sky Air Traffic Management Research

2. Introduction

Currently an improvement in the quality of maritime logistics and an increase in transport efficiency between Finland and Sweden is required. The focus of the Interreg Central Baltic EfficientFlow project during 2018-2020 is on the marine part of the Sweden and Finland in corridors Gävle (Sweden) – Rauma (Finland) and Stockholm (Sweden) – Turku (Finland) and the improvement of the possibilities for just-in-time arrival and departure of maritime transport. In the 2015 Swedish Government Maritime Strategy is stated that new technology is an important tool for increasing safety onboard, but it also means opportunities to increase environmental performance and efficiency in the shipping industry. Among the priorities for research and innovation in the proposal for the National Transport Plan presented to the government in August 2017, one priority in research and innovation is Sea Traffic management (STM): Shipping needs to develop safety and efficiency through digitalization, traffic management and STM, and need to adapt to fossil free fuels and be better integrated into societal planning, not least in order to cope with forthcoming change in the transport system. In the Finland's maritime strategy for 2014 – 2022 it's noted that one of the ways to improve maritime safety can be done by enhancing the vessel traffic monitoring. Probable solutions for lowering the risks in maritime safety is the development of automated and proactive tools for risk identification in the traffic management system. The Finnish maritime strategy also states that the developments in ICT can significantly improve the utilization of the traffic system and services. Real time information on the traffic will provide all actors in the ports up to date information on transportations and on circumstances that can influent on it. Transports can be planned more precisely and the response to changing situations and the information exchange can be done faster. Interreg Central Baltic EfficientFlow project addresses these goals by developing and taking advanced tools for traffic management into operation.

In addition, one of the Policy Area within the EUSBSR is Maritime Safety and Security (PA SAFE). Interreg Central Baltic EfficientFlow project clearly addresses the PA SAFE which says that "At the core of the required procedural improvements are traffic management and traffic control measures involving the monitoring of ship movements, with the aim of preventing the development of dangerous situations." Main target of Interreg Central Baltic EfficientFlow project is to improve the coordination of systems relating to ships' routing and monitoring of the vessel traffic and consider establishing new systems, further improve coordination and information-sharing mechanisms between existing systems to ensure their effective interoperability by implementing STM concept and in transport corridors within project area at the end of the project in 2020.

The precursors of Interreg Central Baltic EfficientFlow project – MONALISA, MONALISA 2.0 and STM Validation projects were all appointed as a flagship project within the Baltic Sea Strategy Action Plan. The MONALISA project with a consortium of 7 partners and a budget of 22 million euro, lasted 2010-2013 and demonstrated route planning and route sharing, which is the forebearer of STM. It also worked with hydrographic data quality, as the predecessor of the FAMOS Projects, and continued the work on global maritime data sharing, known as the Maritime Cloud today, as well as looking at electronic certificates for officers on-board. MONALISA 2.0 was a project with 39 private, public and academic partners from 10 different countries, and budget of 39 million euro. It lasted 2013-2016 and its objective was to define the STM concept. Based on the first MONALISA project and incorporated results and experiences from the SESAR programme in the aviation sector. Four enablers were defined: Voyage Management, services for an individual ship, Flow Management, services involving multiple ships, Port Collaborative Decision Making, services to optimise port calls and SeaSWIM, a maritime digital infrastructure to support all services. The goal of the suggested services is to strengthen efficiency, safety and environmental performance in maritime transportation. The STM Validation Project demonstrated the STM concept in large-scale test beds in both Nordic and Mediterranean waters. The STM Validation Project had

40 partners from 10 countries as well as 40 associate partners from around the world, with a total budget of approximately 43 million euro and ran from 2015-2019. Interreg Central Baltic EfficientFlow project is one of the first implementation projects of the STM concept. The infrastructure will be run in operational 24/7 mode, two ports will integrate the STM solutions in daily operations as will ferries and pilots guiding ships in the narrow fairways in the Swedish and Finnish archipelagos.

Interreg Central Baltic EfficientFlow project is also fully in line with PA Transport, which emphasizes the need for "Facilitation of a sustainable, in view of economic, social and environmental aspects, and efficient transport system in the Baltic Sea Region requires – along with infrastructural investments – also innovative measures dwelling on new technologies, planning approaches and administrative procedures. The Interreg Central Baltic EfficientFlow project strongly supports the implementation of HELCOM Recommendation no. 34E/2 "Further testing and developing the concept of pro-active route planning as well as other e-navigation solutions to enhance safety of navigation and protection of the marine environment in the Baltic Sea Region" which is "RECOGNISING FURTHER the potential of electronic proactive route planning in the Baltic Sea". The Baltic Sea is designated by IMO as a Particular Sensitive Sea Area, why all actions to reduce bunker consumption and emissions are of utmost importance.

3. Methods

Improved exchange of information is an important facilitator for increased situational awareness, shortened lead times in the port call process and there by improved efficiency, safety of navigation and environmental performance. The transport eco-system of the two corridors, Turku – Stockholm and Rauma – Gävle, is complex and the introduction of new concepts of digitization, such as STM, requires willingness, time and resources. STM has been defined in the MONALISA 2.0 project and is validated in the STM Validation project. Interreg Central Baltic EfficientFlow project is partly build on the outcomes from these projects. In the ports of Gävle and Rauma, analyses on the business model and business logic in the respective port (that might be used by other ports after the project) and the collaborative approach of the port actors by STM will be introduced by Living labs. The current Business Model and Logic in the project was determined by carrying out partner meetings and four workshops between the partners and stakeholders, series of interviews of port call actors and reviewing literature. The analysis of the above-mentioned tasks revealed how the enhanced Business Model and enhanced Business Logic will provide the desired time and resource savings without compromising on safety and environment. The STM is a concept for optimizing the processes, interaction between stakeholders and exchange of information within port areas as well as between ports, ships, safety, and interoperability between different domains is also included. The aim of the Interreg Central Baltic EfficientFlow project based on projects mentioned above is to implement STM in these corridors and to develop new ICT tools beneficial for the port actors. The ports of Gävle and Rauma are going to implement the STM concept what will be the first operationalization of the concept in the Baltic Sea region.

New ICT solutions will be planned for and implemented to support the collaborative decision making and the information exchange between all the actors: ports, hinterland operators (rail and road) and ships during the beginning of the year 2020. In the ScanMed corridor via Stockholm and Turku, Traffic Flow optimization will be introduced in the regular ferry traffic in order to facilitate flow optimization in the corridor and to improve situational awareness, facilitate higher predictability and efficiency as well as safety in the corridor within the project frames. Port Call optimization and synchronization by STM including improved info sharing with hinterland operations and automated pilot ordering in Gävle district. The port actors involved in the Interreg Central Baltic EfficientFlow project in Gävle and Rauma are applying STM to facilitate more accurate timing of port operations related to ship traffic. The increased information exchange at the ports of Gävle and Rauma will facilitate an increased flexibility in the port call planning.

The system used for reporting (Maritime Single Window) and planning could be adjusted in a future for handling the information automatically. Changing of business rules and logical rules for doing this is also included in the project. There is a huge amount of manual work involved in both ordering and planning pilots today and this is a real opportunity to save time and get at more effective flow of ships to and from the port. The pilotage ordering and planning of the Swedish Maritime Administration will be made more automatic and less time consuming. The objective will be reached by close collaboration between the partners and with support from important stakeholders.

By STM, the ship traffic in the ScanMed corridor is optimized by more automatic exchange of navigational information ship-to-ship and ship-to-shore. Ferries and other ships in regular traffic involved in the Interreg Central Baltic EfficientFlow project in the ScanMed corridor will be made STM compliant by an upgrade of their navigational system. The Vessel Traffic Services carried out by the Swedish Maritime Administration and the VTS Finland will be made STM compliant and pilots in the region will have STM compliance integrated in their portable pilot units. This will allow the appliance of flow optimization services which will contribute to the optimized ship operations in the ScanMed corridor.

By virtue of the information received, the vessels will be able to regulate the speed of movement and arrive at the place exactly on time. This contributes to reducing the amount of harmful emissions, improving energy efficiency, safety and the socio-economic benefits of the entire traffic flow. A large number of telephone calls between actors will be reduced to a minimum by the introduction of new ICT tools, the risk of misunderstanding and misinterpretation of information will also be reduced, improving the accuracy of the digitized information transmitted at all stages of the logistics chain will reduce the waiting and order fulfillment times. The Interreg Central Baltic EfficientFlow project will disseminate lasting results as open source and best practices for application in other ports and corridors of the region.

4. Results

In the frame of Interreg Central Baltic EfficientFlow project the STM concept will be applied with its new optimized ICT solutions and processes. The ICT solutions will be interoperable in order to be able to serve different users involved in the this project and will contribute to make the flow of goods more efficient and to reduce maritime transport costs and provide time savings for ports of Gävle and Rauma, as well as to improve predictability and quality of overall transportation process. Today a lot of ships are using a higher speed than needed due to incorrect and non-shared times at ports and terminals in ports. By making the times available to all actors the ship can lower the speed and be at the terminal just-in-time. Flow optimization and route optimization will have possibility to facilitate just-in-time arrivals and just-in-time operations, which facilitate to reduced consumption of bunker, reduced emissions and to a more energy efficient transport system and society. STM is foreseen concept to contribute to improve the environmental performance of maritime transport. By optimizing routes of the ships, flow management and by improving the predictability of estimated time of arrival and departure, the fuel consumption in maritime transport is deemed to decrease considerable. This could also contribute to a decrease in emissions and other environmental pollutions as like as to improve navigational safety in sensitive areas of the Central Baltic archipelago, which will facilitate improved biodiversity.

At this stage of development Ships and Port ICT solution we can observe how each port is different from the others. Due to its uniqueness both Port of Gävle and Port of Rauma are preparing to apply the port optimization ICT solution in different ways, which will provides exceptional results in experience for use by other port and hinterland actors. After the project ends the application will be available for implementation by any port or company. The new Ship and Port ICT application, with open technology, is used to develop the system with multiple suppliers and joined by a variety of digital service developers and suppliers. Communication between the Ship and Port ICT application and Online access point will ensure that the maximum possible degree of consistency is achieved between information residing in the Ship and Port ICT application and at the Online access point, depending on the online status of the ship. If information consistency decreases due to the status of communication links with the ship, the communication status and the age of information will be known by both ends. The online access point is constantly and stably connected to the internet and represents the port towards other actors and services. The Ship and Port ICT application is a mobile-friendly responsive website with the possibility to send push-notices for iOS and Android units. Two modules "Port Activity" and Logistic Chain" will be available but the project will start with the Port Activity module. Each module will independently interact with the database. The Ship and Port ICT application administrator shall be able to turn on and off a module. The Ship and Port ICT application will be available for all port actors and hinterland operators. To get access to Ship and Port ICT application the user has to make a registration and log in.

The Interreg Central Baltic EfficientFlow project will use the improved port call optimization, synchronization and improved information sharing to automate the information flow needed for making the port call process more efficient and to shorten the total turnaround time for the involved in this project ships in the port. This more

accurate real time information sharing will also facilitate automatic pilot ordering and the pilot planning and administration in Gävle. Business models and business rules for doing this are included in the project, there will be also a standardized way of communicating between the systems involved. The improved situational awareness created by the Ship and Port ICT application in the ports of Gävle and Rauma facilitate increased information exchange between ports and hinterland operators involved in the Interreg Central Baltic EfficientFlow project in order to ensure increased and efficient transport flows.

The basic principle of the Ship and Port ICT application will be that port actors share their estimated and actual times regarding certain states in the port call process as a minimum set of data. The implementation of STM in the ports of Gävle and Rauma will be the first operationalization of the concept in the Baltic Sea region. The Interreg Central Baltic EfficientFlow project will apply Ship and Port ICT application in the ports of Gävle and Rauma and connectors with port actors involved in this project will be developed and tested during the year 2020. The port actors will establish a closer collaboration and information sharing. Information between the ports and involved in the project hinterland operators will also be addressed. The expected time savings resulting from the project for ports of Gävle and Rauma will be estimated with collected indicators from port actors.

STM and information sharing between ports and hinterland operators are not limited to a certain geographical area and the results of the Interreg Central Baltic EfficientFlow project will not only be possible to share with other ports or actors of the Central Baltic region, but also beyond. In addition, results also will be transferred to higher educational institutions and scientific society for use in the learning process and for further studies.

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