D1.2 Corridors in Planning and Monitoring

Project Number:	
Classification	Public
Deliverable No.:	D1.2
Work Package(s):	WP1
Document Version:	Vs. 1
Issue Date:	31.12.2018
Document Timescale:	Project Start: June/July 1st (Poland), 2018
Start of the Document:	Month 4
Final version due:	Month 6
Compiled by:	OFF,NTR
Authors:	Matthias Steidel
Issue Authorisation:	Sebastian Feuerstack, OFF

HANSA is funded by the MarTERA partners German Federal Ministry of Economic Affairs and Energy (BMWi), Polish National Centre for Research and Development (NCBR) and Research Council of Norway (RCN) and co-funded by the European Union.

DISTRIBUTION LIST		
Copy type[1]	Company and Location	Recipient
T	HANSA Consortium	all HANSA Partners

[1] Copy types: E=Email, C=Controlled copy (paper), D=electronic copy on Disk or other medium, T=Team site (OwnCloud)

RECORD OF REVISION		
Date	Status Description	Author
2018-12-11	Initial Definition	MS (OFF)
2018-12-18	Definition of Ship Groups	MS (OFF)
2018-12-19	Definition of Ship Groups	MS (OFF)

Table of Contents

1 Introduction

This document gives a final definition of Recommended Corridors based on the initial definition given in Deliverable 1.1. As stated before, a large volume of historic AIS messages and historic weather data is analysed in order to derive traffic pattern. The analysis considers vessel's attributes in combination with the prevailing weather conditions. Furthermore, this document presents the attributes of the vessels to be used for the analysis. One contribution of HANSA will be the calculation of Recommend Corridors for similar ship types. For this purpose, rules for grouping vessels will also be presented.

2 Concept of Recommended Routes

2.1 Definition

A recommended corridor (RC) describes a safe route from a port of departure or ship position to a destination. This corridor is most commonly used by ships with similar attributes (such as draught or destination port) and under similar weather conditions in order to travel to the designated destination. These traffic pattern are extracted by analysing historic vessel movement data and by augmenting this data with historic weather data. Furthermore, a RC considered the direction of travelling, meaning the obligation to drive on the right is represented by the RC. This enables better improvements in the context of collision avoidance and traffic planning.

By considering vessel's attributes like the draught, the calculated traffic pattern are much less prone to encounter shallow or unsafe water. This will also minimize the risk of intrusions of vessels in Marine Protected Areas (MPA). Figure 1 illustrates the HANSA principles.

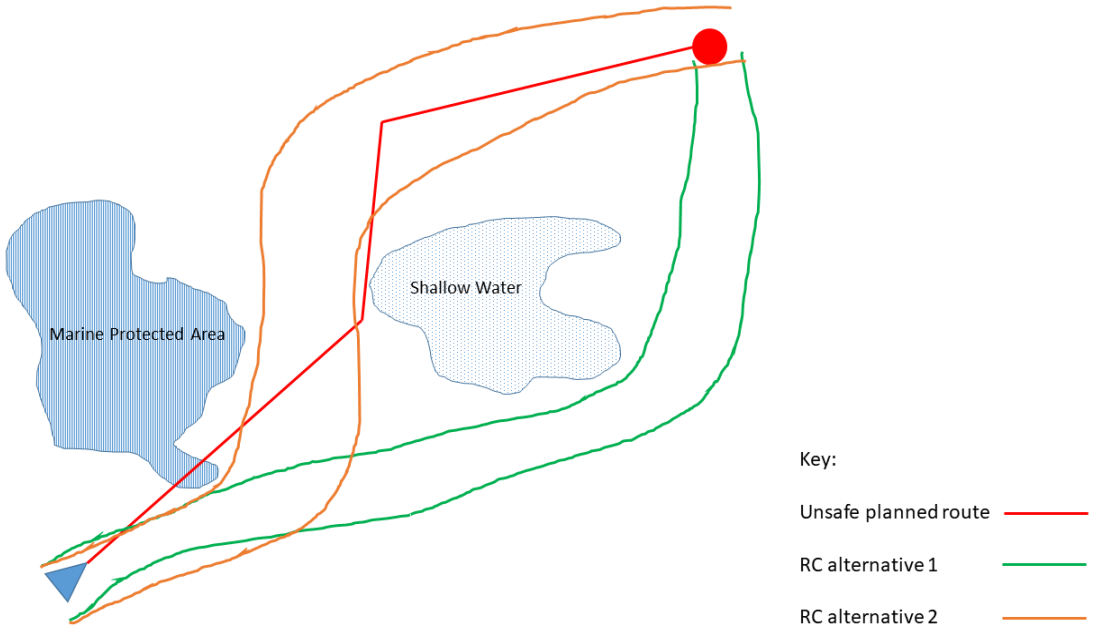

Figure 1: HANSA principles for generating a recommended corridor

Starting from the blue ship at the bottom left, the navigators have planned the red route to the port of destination (red circle). As one can see, this route proceeds through a Marine Protected Area and very close to shallow water. The risk of drifting into the shallow water area is increased by environmental conditions such as wind direction, wind speed and the wave height. The intended HANSA prototype finds two recommended corridors (green and orange). The final selection of the RC that is proposed to the navigators depends on current weather conditions and the vessel's attributes.

2.2 Selected Attributes based on Data Sources and Reliability Analysis

Based on the initial data analysis from Deliverable 1.1, an extended analysis of the data was carried out. The results of this analysis confirm the previous results. Due to this, the following attributes of a vessel will be used in the data analysis process.

Attribute	Description
MMSI	Maritime Mobile Service Identity. Identifies a vessel in AIS.

Navstatus	The current navigational status of a vessel transmitted via AIS. This status describes the current activity of a vessel, e.g. whether it is underway or anchoring.
Rate of Turn	Indicates the current rate of turn of a vessel.
Speed Over Ground	The current speed over ground of a vessel.
Longitude	The current longitude.
Latitude	The current latitude.
Course Over Ground	A vessel's current course over ground.
Heading	A vessel's current heading.
IMO	International Maritime Organization Number is a unique reference for ships.
Call sign	A vessel's call sign.
Ship name	The name of a vessel.
Ship type	The type of the vessel. Here, the ship type definition provided by AIS is used.
Distance to Bow	The position of an AIS antenna relative to the bow.
Distance to Stern	The position of an AIS antenna relative to stern.
Distance to Port	The position of an AIS antenna relative to the portside.
Distance to Starboard	The position of an AIS antenna relative to the starboard side.
ETA	Estimated Time of Arrival at the vessel's destination.
Draught	A vessel's draught.
Destination	The destination of the vessel's current journey.

Table 1: Selected Attributes

2.3 Rules for Groups of Vessels

For D1.1, an initial data analysis has been carried in order to have a first insight into the data provided by each partner. During this analysis, the following ship types occurred:

- WIG (Wing in Ground Craft)
- Vessel (engaged in activities, e.g. fishing, towing, dredging, diving, military, sailing, pleasure craft)
- High Speed Craft
- Special Craft (pilot, search and rescue, port tender, tug, anti-pollution, law enforcement, medical or sate not party to an armed conflict)
- Passenger Ship
- Cargo Ship (with hazardous liquid materials classification)
- Tanker (with hazardous liquid materials classification)
- Other Ship

The proof of the HANSA concept for RC is done by implementing a prototype that calculates RC for the most frequently occurring ship types in the available data. According to the data analysis from D1.1, the most frequently occurring ship types are:

- Cargo Ship
- Tanker
- Passenger

Grouping vessels based on statistics obtained from the available data is not recommended by the HANSA consortium since this depends strongly on the considered region. An initial classification of ships into static classes may have the disadvantage that the classification is not consistent for all regions of the world. In order to provide a useful classification for this problem, a deeper look into the data and the selection of different regions is necessary. A challenge in this context is the segmentation into different regions. A

suitable approach for solving this challenge will be identified during the upcoming work. With the completion of the Deliverables 3.1 to 3.2, a final concept for solving this challenges will be presented.

3 Feedback from User Communities

The survey of various experts and potential users resulted in predominantly positive feedback for the HANSA project. In addition to potential added value for safe route planning, the potential for the development of new, intelligent systems was recognised in order to enable the operation of highly automated vessels in the near future. With regard to the operation of today's ships, the nautical experts welcome any systems that increase the Situation Awareness and reduce the workload of the crew. The interviews show that the RC must take the direction of travel into account. That means that the RCs issued respect the right-hand drive requirement. For a later, potential integration into today's ECDIS, the concrete functionality must correspond to the requirements of the users. These requirements can be determined by further interviews.

4 Conclusion

This document provides a more precise definition of the RC concept. The necessary ship attributes for the calculation of the RC were also presented. During this WP, the consortium came to the conclusion that a static classification of the vessels in class is not feasible at current times. This can be justified by the fact that there are different requirements for the classification of ships depending on the region. The general water depth plays just as important a role as the dependence of certain sea areas on the tide. During the WP3, the definition of regions and vessel classes will be evaluated and presented at the end of this WP. Finally, it should be noted that the HANSA concept has received positive feedback from domain experts and nautical experts.