

Enhanced Maritime Spatial Planning through VTS

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Abstract— Maritime Spatial Planning has become an essential requirement in order to ensure and contribute to the protection of the marine environment. The challenge is to regulate economic interests by simultaneously ensuring appropriate levels of safety for the various off-shore activities in coastal and open sea areas like fish farming, establishing operating wind farms and other activities mainly focusing on avoiding any limitations to safe and efficient vessel traffic flows from and to ports. International and national rules and regulations, recommendations and guidelines and other legal and administrative measures have been developed, established and set into force to avoid uncoordinated actions and activities. Even though the procedures and processes for spatial planning in the maritime domain has successively been improved there seems to be still potentials for optimization of the planning. As a hypothesis, those potentials are expected by extending and improving the data basis used for the description of the current and the forecasting of the potential future situation in respect of the environment and the traffic activities. This paper presents interim results of an ongoing study specifically focusing on available traffic and environmental data and on the use of available guidelines and data sources for potential improvement of the planning processes. Expert opinions have been surveyed and analyzed and first preliminary recommendations are derived as suggestions.

Keywords: Maritime Spatial Planning (MSP), Vessel Traffic Service (VTS), Data.

I. INTRODUCTION

Maritime Spatial Planning (MSP) is becoming increasingly important for the management of the seas and oceans, in the way it contributes to the sustainable development goals, specifically to goal fourteen (Life below water) by enhancing the sustainable use of the sea and oceans resources [1]. However, it has become obvious that MSP requires a much more holistic approach as it is still in use and which integrates the multiple users of the seas including shipping, offshore installations (e.g. renewable energy), conservation, tourism, aquaculture, fishing, cables & pipelines, deep-sea mining and governments in order to make more profound decisions about how to use marine resources sustainably and reduce conflict between users [2][3]. MSPs basing on limited consideration of influencing factors and incompletely reflecting the situations have resulted in inefficient processes and inappropriate solutions (see figure (1)).

As depicted in the sample, the original route (dotted red line) of a North-South bound ferry service had to change due to the construction of the offshore wind farms (OWF) (Thornton Bank) and caused a number of issues. Among others, the ferry originally had a clearly straight forward northerly course with no need for numerous course change

manoeuvres. The course of the ship obviously was easy to predict. With the established offshore wind farms, ferries have to avoid the (dotted red line area) which potentially could confuse ships in the north bound traffic separation scheme (A) which are give-way vessels when meeting a ferry on her leg to the North [4].



Figure (1) Sample of a planned wind mill farm in maritime space with heavy dense traffic (Picture taken from [4])

The case from figure (2) below illustrates, gathering information of the current status of the seas and coasts either economical, ecological or biological information are all essential for the MSP process in-order to understand and analyze the existing conditions of the areas intended to plan, and transportation is among the economic activities which need to be shown and mapped spatially and temporally for planning purposes [5]. A study conducted by Fiorini [6] demonstrated the visualization of the shipping density timely and spatially for MSP purposes using the Automatic Identification System (AIS) data as a prime source of data collection.

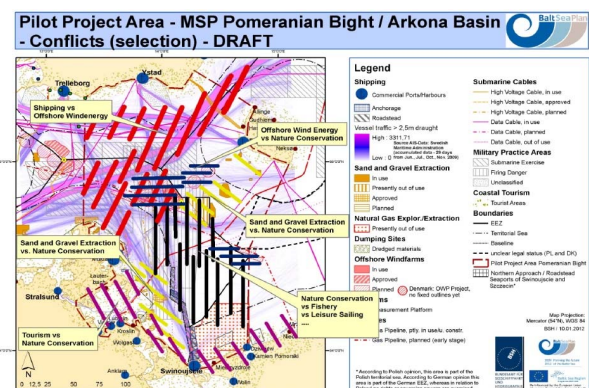


Figure (2) Draft MSP Pomerania Bight Conflicts (Picture taken from [7])

Recent studies by HELCOM demonstrated again the results of shipping traffic density and related shipping issues in the Baltic Sea Region using the AIS data [8] as well.

In this paper, the system of Vessel Traffic Services (VTS) will be presented as one of the existing “tools” in the maritime domain, established to monitor traffic activities in the covered areas and ensure safe and efficient traffic flow and that probably can contribute to enhance MSP.

Originally VTS has been defined by a resolution of the International Maritime Organization (IMO), the United Nations' specialized Organization on maritime issues. According to IMO resolution A.857 (20) 'Guidelines for Vessel Traffic Services' a VTS is defined as "a service implemented by a Competent Authority, designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with the traffic and to respond to traffic situations developing in the VTS area. ...". Within the context of studying the potentials and possibilities of using VTS for MSP purposes, VTS is furthermore considered as an integrated multi-sensor system which collects various type of data including, among others; AIS, Radar, meteorological and hydrological data [9].

Maritime Spatial Planning, is comparably new and is explained in several sources and in different ways with varying level of details and contexts. Sometimes it is also mentioned as Marine Spatial Planning. However, a frequently used and commonly referenced definition is provided by UNESCO, who states that MSP is a “public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives that are usually specified through political process” [2].

From a global and general perspective, it can be stated: while MSP is about the systematic planning of the future use of maritime space; VTS is about monitoring a certain sea area for purposes of safety and efficiency of the vessel traffic flow and the protection of the marine environment from hazardous events. Although VTS and MSP are both focusing on sea areas, so far, there seems to be no or only a weak link between them as VTS and MSP are carried out in a rather separated way. In order to get more insight and background, a study was planned to investigate the perspectives of the experts and stakeholders and if there are potentials to improve MSP.

Moreover, the study specifically takes into account the guideline on "Navigational Safety within Marine Spatial Planning" [10] recently published by the International Association for Marine Aids to Navigation and Lighthouse Authorities (IALA). This guideline specifically mentions the potential use of VTS as a tool for MSP purposes which will bring positive results not just for the data sharing, but also for the stakeholder engagements as the VTS authorities can contribute during the planning.

II. METHODOLOGY AND CONDUCTION

A general overview on the opinion of MSP and VTS experts will be presented as a result of data collected based on qualitative and quantitative surveys, coupled with literature review.

However, the scope of the general overview is to bring to the notice of MSP experts the Vessel Traffic Service (VTS), to introduce how it works and discuss what are the opportunities of using such “tool” for the MSP. On the other hand, to bring to the notice of the VTS experts the Maritime

Spatial Planning (MSP), to introduce the concept and to understand what are the MSP needs and processes.

For the purposes of an empirical study surveys, questionnaires, phone calls and face-to-face interviews were developed and conducted to involve VTS and MSP experts. Both experts' groups are from several domains (to have a wider perspective) and countries in order to analyse their perspectives in respect to the possible new use of VTS data.

The first survey was conducted for thirty-four international MSP experts from different continents. The criteria of choosing the MSP respondents focused on experts who are working on the planning directly, or in cross-sectors related to the planning. Nevertheless, MSP experts were reached through personal network and as well through the MSP Research Network platform. The survey included questionnaire, phone calls and interviews. It was conducted between the time period of January and June 2018. However, all of the respondents were asked about their role in the MSP field, as figure (3) shows, based on the answers, all of the participants have different roles including, researchers, academia, planners, project coordinators, intergovernmental organizations, authorities and consultants.

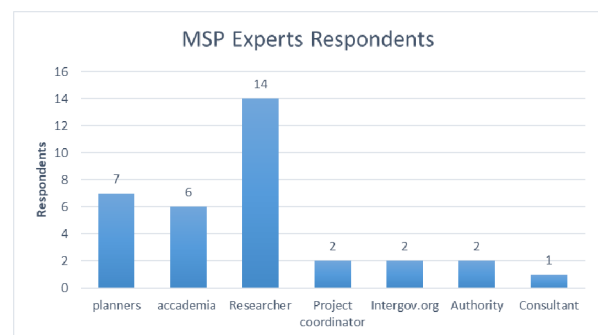


Figure (3) Roles of the MSP expert's respondents

On the other hand, the second survey was conducted for twenty international VTS experts also from different continents. The criteria of choosing the VTS respondents focused on experts who are working in the VTS centres VTS authorities, and other sectors related to the VTS domain. Nevertheless, experts were reached through personal network. The survey which included questionnaire, phone calls and interviews was conducted between the time period of January and June 2018. However, all of the respondents were asked about their role in the VTS field, as figure (4) shows, based on the answers, all of the participants have also different roles including, VTS centre personnel, VTS technicians, researchers, academia and authorities.

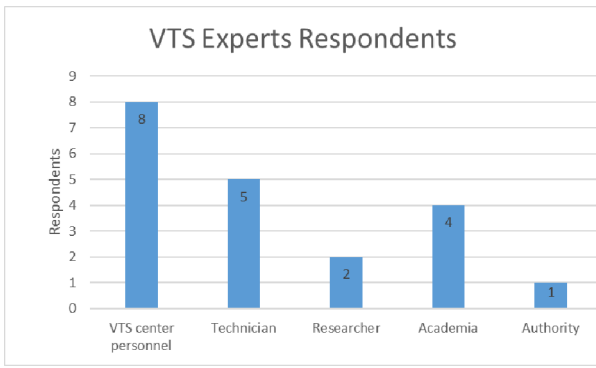


Figure (4) Roles of the VTS experts

However, based on the answers from the two different experts' respondents, it was noticed that most of the VTS experts have expertise in the VTS field for more than ten years. While most of the MSP experts have expertise in the MSP field between one-to-five years.

III. SELECTED PRELIMINARY OUTCOMES AND DISCUSSION

The surveys included several questions for both groups of experts. However, in this paper just few questions' results will be demonstrated, as the paper presents preliminary results of the complete research

A. Experts awareness of the IALA guideline

Referring to all the guidelines in the MSP field, In June 2017 the IALA published the guideline (Navigational Safety within Marine Spatial Planning), which is the only guideline in the MSP field focusing on the potential use of the VTS in Maritime Spatial Planning (e.g. to share the VTS data during the identification of the current conditions of the areas intended to plan, and also to engage the VTS authorities as stakeholder during planning). For this a question for both experts was asked about their awareness of the IALA guideline. However, figure (5) shows that only approximately 1/5 of the MSP experts' respondents were completely aware of it, in other words 82% of the MSP experts' respondents are somewhat or not aware of the guideline.

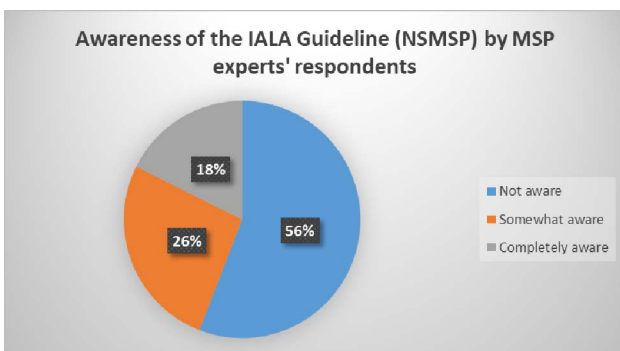


Figure (5) The awareness of the MSP experts' respondents of the guideline

On the other hand, as figure (6) shows, there were only 1/3 of the VTS experts' respondents aware of the guideline, in other words, 70% of the VTS experts respondents are somewhat or not aware of the IALA guideline.

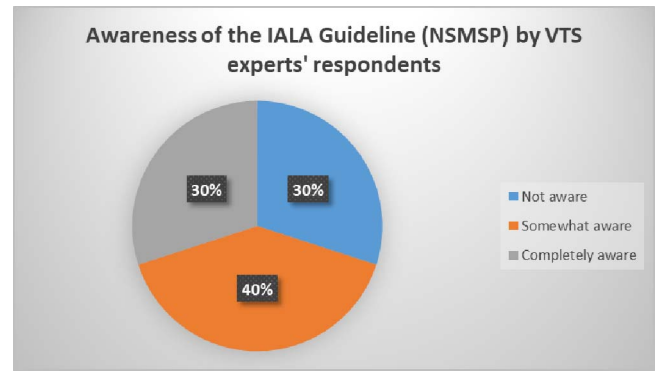


Figure (6) The awareness of the VTS experts' respondents of the guideline

These results can be interpreted in a way that there is a potential lack of communication from the IALA to the both targeted experts. And in addition, the MSP process are mostly not addressed by the IALA, which might not attract the planners or the MSP experts' attention to follow with the IALA guidelines and standards.

B. Opinions of the MSP experts regarding the use of the VTS data for MSP purposes

Since their inception VTS centers have grown substantially on a global level, this has led to a division of the operational concept in two categories: Port VTS and Coastal VTS (see i.a. the IALA VTS Manual, 2016 and IMO Resolution A.857(20) for more explanation).

After explaining the operational concept of the two VTS types, experts were asked; how these two types of VTS could contribute for the MSP. Figure (7) shows that 32% of the MSP experts respondents would definitely consider the use of the Port VTS for MSP purposes. However, the biggest part of the MSP experts' respondents 62% considered that port VTS data might or might not be supportive for the MSP. This might be interpreted that MSP experts may need to become more familiarize with the port VTS.

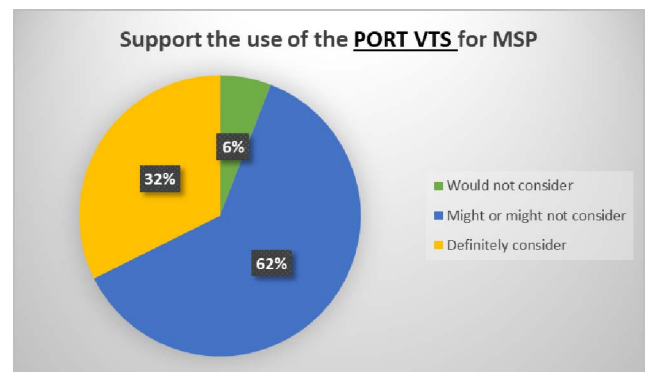


Figure (7) use of the Port VTS for MSP

Furthermore, MSP experts' respondents stated that the port VTS; will help to engage and share data with the maritime authorities about the port management and activities during the planning. But this will also depend on the scale of the areas intended to plan. Moreover, respondents mentioned that the use of port VTS data might be useful in case of allocating and co-locating human activities in the port areas or in the vicinity.

The following figure (8) shows that 50% of the MSP experts respondents would definitely consider the use of the Coastal VTS for MSP purposes, even though this is the opinion of the biggest part of the respondents group. The other half of the MSP experts' respondents are either uncertain or would not consider the use of the coastal VTS data for MSP purposes.

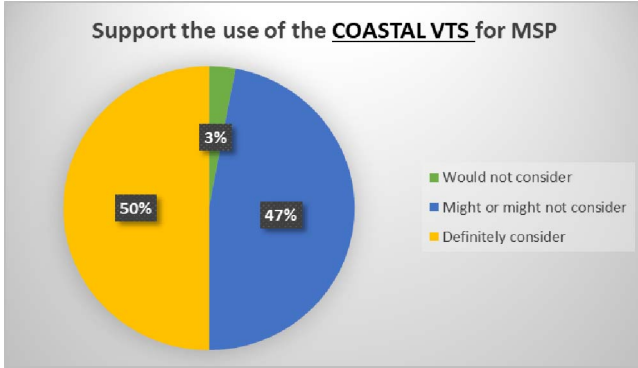


Figure (8) use of the Coastal VTS for MSP

For the use of the coastal VTS, MSP experts' respondents highlighted that; it will be interesting to use the coastal VTS data for hotspot spaces with high density of human activities (e.g. shipping, fishing, offshore infrastructures), and also for spaces where there is high traffic density from non-commercial vessels who are not obliged to have the AIS on-board including e.g. recreational vessels, personal watercraft and small scale fishing boats. MSP experts' respondents mentioned also that the coastal VTS data would be used to mitigate threats to environmentally sensitive areas in the ocean as well, but again depends on the planning scale.

C. Opinions of the VTS experts regarding the use of the VTS data for MSP purposes

The same question which targeted the MSP experts was also given to the VTS experts if they support or oppose the use of the VTS data for MSP purposes. Figure (9) shows that 60% of the VTS experts respondents are strongly in favour of using the VTS data for MSP purposes and 30% of them are also somewhat in favour.

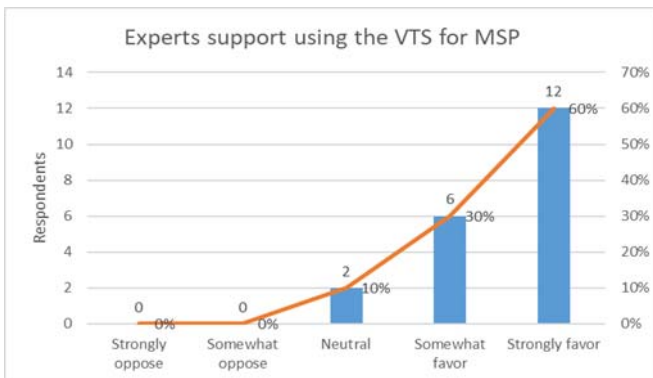


Figure (9) VTS experts' opinion of using the VTS for MSP

During the discussion with the VTS experts' respondents, they mentioned that; planners can have more accurate visualization for the traffic density, as the VTS merge the ships' track data originated from the AIS and the Radar. This means, VTS provides more complete traffic data which includes also the vessels who are not obliged to have the AIS on board. Moreover, they mentioned that the VTS provides

more accurate and comprehensive statistics which can be supportive during the planning.

D. Potential impact of MSP on the further development of VTS

Even though the focus of this study is laid on the use of VTS for purposes of MSP, there are also some observations on how MSP might have impact on the future development of VTS. These observations origin from expert workshops and conferences discussing the overall development in marine transportation with specific focus on sustainability of shipping up to the introduction of autonomously navigating and even unmanned ships. Regulatory frameworks are needed to prepare for the integration of "Maritime Autonomous Surface Ships" which is IMO's terminology for this latest development in shipping mainly driven by development of enhanced technology of system suppliers and manufacturers.

IMO is responding to those developments by a scoping exercise looking into needs for legal frameworks when integrating MASS into existing vessel traffic. At the latest session of IMO's Maritime Safety committee MSC99, it was also decided to revise the existing IMO resolution on VTS Guidelines [11]. IALA working groups are to contribute to the revision of the resolution by developing suggestions how to restructure the services and also clarify the presently valid resolution. In relation to MSP there are ongoing discussions and investigations if there might be a need to reserve sea space for establishing traffic lanes specifically dedicated for MASS traffic. VTS authorities needs to be involved into these discussions also when planning and establishing testbeds for MASS in areas covered by VTS monitoring.

Finally, there has been observations discussions on enhanced sea traffic management and to take into account development of concepts for dynamic route planning that considers, e.g. also coastal zones that are sensible due to natural requirements (e.g. avoidance of air pollution by emissions or certain species and birds that needs protection and shall not being disturbed by vessel traffic). Such requests are currently not or only taken into consideration in a very limited minor way. Future VTS operation therefore, might benefit from MSP data when this become a request.

IV. SUMMARY AND CONCLUSION

An empirical study on the use of VTS as a tool to support improvement of Maritime Spatial Planning has been conducted. Thirty-four MSP experts and twenty VTS experts participated in a spotlight survey on the subjective views of the operators regarding the use of VTS data for potential enhancement of MSP. Beside numerous existing rules and regulations, recommendations and guidelines for MSP, only the Guideline "Navigational Safety within Marine Spatial Planning" elaborated and published by IALA specifically recommend the use of VTS data for enhancing MSP processes.

Interviews (face-to-face and on phone calls and web-based online questionnaires) have been used to gather qualitative and quantitative results.

The preliminary results seem to rather support, that there is a lack of communication and knowledge between the two

experts' groups which results in the limited use of VTS data. Maritime spatial planners seem to be not aware of the guideline and the potential of VTS data for MSP purposes.

This existing gap can be probably reduced if there would be more continuous communication and knowledge exchange. Common workshops, training and other activities may contribute to minimize this gap. However, the results of the spotlight study are somehow surprising, because the guideline has already been published for more than one year.

It is also concluded that VTS data are more comprehensive than just only AIS data. Spatial planners can surely benefit from such more comprehensive data by more reliable modelling and simulating of various future traffic scenarios.

Finally, it has been observed, that there is potential also for VTS to benefit from comprehensive MSP addressing new developing requirements from marine environmental protection and the introduction of new technology and MASS.

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