Integration of Maritime Spatial Planning into the Waterways Safety Management studies

Madli Kopti1,2, PhD Student; Roomet Leiger1, MSc; Dr. Inga Zaitseva-Pärnaste1, PhD; Captain Jarmo Köster1

1. Estonian Maritime Academy of Tallinn University of Technology, emera@ttu.ee, 101 Kopli Str, 11712 Tallinn, Estonia
2. University of Tartu, Estonian Marine Institute, 14 Maealuse Str, 12618 Tallinn, Estonia

Abstract Maritime spatial planning (MSP) arose in the beginning of the millennium as a response to a historic failure to protect the marine environment, because of an increased competition for marine space and the opportunities for economic growth [1]. The EU Directive established a framework for maritime spatial planning [2] and defined objectives of maritime spatial planning (MSP) as follows “When establishing and implementing maritime spatial planning, Member States shall consider economic, social and environmental aspects to support sustainable development and growth in the maritime sector, applying an ecosystem-based approach, and to promote the coexistence of relevant activities and uses. Through their maritime spatial plans, Member States shall aim to contribute to the sustainable development of energy sectors at sea, of maritime transport, and of the fisheries and aquaculture sectors, and to the preservation, protection and improvement of the environment, including resilience to climate change impacts. In addition, Member States may pursue other objectives such as the promotion of sustainable tourism and the sustainable extraction of raw materials.” Since historic times, the Baltic Sea has been an important route for maritime trade. During the last decades, the number of ships sailing in the Baltic Sea and their sizes have continued to increase and, therefore, there is growing need for efficient integration of maritime safety into process of MSP.

Estonian Maritime Academy of Tallinn University of Technology (EMARA TUT) is the only educational institution in Estonia that offers higher education in the maritime field. One of the main aims of EMARA TUT is to provide the maritime labour market with highly qualified specialists in different maritime fields. Waterway Safety Management (WSM) is one of the study programmes in EMARA TUT focusing on the development of comprehensive and broad-based knowledge in all aspects of the theory and practice of waterway engineering and maritime safety. WSM studies are regulated by International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and International Hydrographic Organization (IHO). Studies of WSM are associated with planning and optimization of fairways, charting and surveying navigable waters etc. Graduates work in organizations responsible for ensuring safe navigation of maritime transport in Estonian and international waters. Though, these organizations are not responsible for carrying out the official MSP, they are the key stakeholders, data providers and decision makers in line with safe shipping during the MSP process. Because of the above-described situation and due to the rapid development of MSP in the Baltic Sea region and worldwide there is a need for integrating the MSP efficiently into to the WMS studies.

The contribution attempts to demonstrate the efficient methods on the integration of MSP into the WSM studies. Efficient integration of MSP into the studies of WSM study process will provide students with broad knowledge on the interconnection of WSM and MSP and provide an effective interdisciplinary approach to MSP process.

Keywords: maritime spatial planning, the Baltic Sea, waterways safety management, maritime safety, maritime education.
1. Introduction

Maritime spatial planning (MSP) is having considerable importance all around the world, especially in European Union (EU). According to the United Nations Educational, Scientific and Cultural Organization (UNESCO) initiative [3] “MSP is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process. Characteristics of MSP include ecosystem-based, area-based, integrated, adaptive, strategic and participatory approach. MSP is not an end in itself, but a practical way to create and establish a more rational use of marine space and the interactions among its uses, to balance demands for development with the need to protect the environment, and to deliver social and economic outcomes in an open and planned way.”

Numerous countries have started to establish MSP to achieve sustainable use, to ensure biodiversity conservation in ocean and coastal areas, to encourage investments, to increase cross-border cooperation, to enhance “blue growth”, to support synergies and coherent use of marine space among different sectors such as shipping, energy, environment, fisheries, defense etc.

Originally, the concept of MSP was stimulated by international and national interests in developing marine protected areas (MPAs). More recent attention has been placed on planning and managing multiple uses of marine space, particularly in areas where use conflicts and potential synergies and co-use are already well known and specified. In various countries marine regional planning concepts are being used as a first step to make ecosystem-based marine spatial planning a reality. Ecosystem based approach is supported by the EU and the Baltic Marine Environment Protection Commission (HELCOM). For example, Directive 2014/89/EU establishing a framework for maritime spatial planning states [1]: “in order to promote the sustainable growth of maritime economy, the sustainable development of marine areas and the sustainable use of marine resources, maritime spatial planning should apply an ecosystem-based approach.” Additionally, the Fifth Ordinary Meeting of the Conference of the Parties to the Convention on Biological Diversity, Nairobi 2000 [4] defined the “ecosystem approach” as “... a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.” HELCOM and the Commission for the Protection of the Marine Environment of the North East Atlantic (OSPAR) jointly adopted their common vision [5] of an “ecosystem approach” as “the comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity.”

The need for maritime spatial planning in the region guided the European Union (EU) to develop legal framework for MSP. In July 2014 was adopted Directive of the European Parliament and of the Council establishing a framework for maritime spatial planning (MSP Directive) where Article 15 states that the maritime spatial plans shall be established as soon as possible and at the latest by 31 March 2021. Because of the set requirements in MSP Directive, the development of MSP is especially rapid in the EU. The Directive establishes a framework for MSP [2] and defines objectives of MSP as follows: “When establishing and implementing maritime spatial planning, Member States shall consider economic, social and environmental aspects to support sustainable development and growth in the maritime sector, applying an ecosystem-based approach, and to promote the coexistence of relevant activities and uses. Through their maritime spatial plans, Member States shall aim to contribute to the sustainable development of energy sectors at sea, of maritime transport, and of the fisheries and aquaculture sectors, and to the preservation, protection and improvement of the environment, including resilience to climate change impacts. In addition, Member States may pursue other objectives such as the promotion of sustainable tourism and the sustainable extraction of raw materials.”

One of the main purposes of higher professional education is to prepare highly qualified specialists, who are productively able to contribute in different sectors by offering relevant qualifications, high-
level knowledge and skills. Due to the rapid developments of MSP, there is a need to integrate appropriate education into corresponding studies that is exemplified in this article by integrating MSP studies into the Waterway Safety Management curriculum.

2. Analysis of Waterway Safety Management subjects in line with Maritime Spatial planning study program

Higher education in Estonia is regulated by Universities Act, Institutions of Professional Higher Education Act, Private Schools Act, and the Standard of Higher Education. There are two types of higher education institutions in Estonia: universities and professional higher education institutions. Estonian Maritime Academy of Tallinn University of Technology (EMARA TUT) provides first level professional higher education, but also offers one master’s level degree programme (Maritime Studies). EMARA TUT is the only higher education institution providing professional higher education and master’s level education in the maritime field in Estonia. EMARA TUT provides the maritime labour market with highly qualified specialists in different maritime fields. Waterway Safety Management (WSM) is one of the study programmes in EMARA TUT, focusing on the development of comprehensive and broad-based knowledge in all aspects of the theory and practice of waterway engineering and maritime safety. The contents of the curriculum of Waterway Safety Management enable students to build specialized knowledge, skills, and gain qualifications, which equip them for employment, primarily in Estonian Maritime Administration or other related organisations, as hydrographic surveyors, marine cartographers, waterway engineers or specialists in diversity of occupations in navigation service and coastal engineering. The curriculum is developed in compliance with the International Hydrographic Organization (IHO) Standards of Competence for Hydrographic Surveyors and Nautical Cartographers. Additionally, graduates can continue their studies in the second-level higher education (master’s level degree programme).

2.1 Waterway Safety Management study program

Going through the curriculum, students acquire comprehensive knowledge of the theory and applications of hydrography and allied disciplines. The curriculum enables to develop competencies necessary for performing various hydrographic surveying tasks and providing assistance to marine navigation, port management and coastal engineering. The curriculum offers a thorough introduction to geodesy, hydrography and cartography as well as into coastal sea processes. Mandatory practices offer opportunities to learn different techniques of hydrography and provide hands-on experience in land surveying, hydrographic surveying, nautical cartography and coastal engineering, with reference to environmental aspects.

According to the IHO S-5 Standards of competence for hydrographic surveyors (publication includes the minimum standards for international recognition of programmes of hydrographic training at two levels) students should study appropriate procedures and limitations for the use of hydrographic surveying equipment in compliance with environmental laws and marine protected area regulations and the role of hydrographic data in Marine Spatial Data Infrastructures [6].

2.2 Integration of Maritime Spatial Planning into the Waterways Safety Management study program

MSP study program provides 2 credit points in line with the European Credit Transfer and Accumulation System (ECTS). According to the European Commission document about ECTS use [7], “ECTS is a learner-centred system for credit accumulation and transfer, based on the principle of transparency of the learning, teaching and assessment processes. Its objective is to facilitate the planning, delivery and evaluation of study programmes and student mobility by recognising learning achievements and qualifications and periods of learning. ECTS credits express the volume of learning based on the defined learning outcomes and their associated workload. 60 ECTS credits are allocated to the learning outcomes and associated workload of a full-time academic year or its equivalent, which
normally comprises a number of educational components to which credits (on the basis of the learning outcomes and workload) are allocated. In most cases, workload ranges from 1,500 to 1,800 hours for an academic year, which means that one credit corresponds to 25 to 30 hours of work. It should be recognised that this represents the typical workload and that for individual students the actual time to achieve the learning outcomes will vary.”

Aim of MSP subject is to give an overview about the MSP and skills how to compile Maritime Spatial Plan. On the completion of MSP course student should achieve following learning outcomes: 1) knows the meaning and importance of the Maritime Spatial Planning; 2) gives an overview about the political issues considering the Maritime Spatial Planning; 3) knows and exemplifies different phases of the Maritime Spatial Planning process; 4) gives an overview about the different IT programs/software that are used for spatial data presentation and management; 5) knows the situation of the newest Maritime Spatial Plans in Europe, including Estonia. Learning outcomes mean the minimum level of knowledge, skills and attitudes that have to be acquired as a result of passing the subject or the completion of the curriculum [8].

The subject topics have been divided into 8-week sessions and during the studies following topics are covered: introduction, overview of the MSP, phases of the MSP process, political issues of the MSP, IT programs and software used for the MSP, MSP in Europe and in Estonia. First three weeks of studies focus on giving an overview about the MSP and special focus is on the detailed introduction of full cycle of MSP process (Figure 1), by having detailed approach on every phase starting with assessing the MSP context and finalizing with the evaluation of results.

![Figure 1 Process of MSP](image)

After receiving a clear overview about MSP process details will be focused on the overall development directions of MSP by giving examples on MSP experiences of different countries and MSP related
scientific results. For this, students have to work through different countries corresponding MSPs (group work) and one scientific MSP related paper and present the first results in e-learning environment and second one is presented as oral presentation in the classroom. Additionally, special attention is on the political developments in line with MSP. Last section of the studies focuses on using different geographical information systems (GIS) for gathering MSP related spatial information. The last part exercise is mainly based on using existing public MSP maps and data providers such as HELCOM Baltic Sea data and map service [10] or European Atlas of the Seas [11]. The main focus of the exercise is to acquire knowledge about the possibilities of mapping the MSP relevant information and how to use different GIS tools and features such as metadata, identification of data, downloading the data etc. Additionally, a test is carried out to gain knowledge about EU's spatial information infrastructure developments, different data formats, national MSP data providers and GIS software.

Until year 2015, the course on MSP was mandatory in WSM curriculum. After 2015 the course is optional and included in the Waterway Safety Management and Port and Shipping Management study programmes. Hydrographic specialists need to engage with other users of marine and coastal areas, to ensure that the principles of MSP are taken into consideration while planning waterways and therefore minimising potential conflict between users. Since graduates of the programme work in organizations responsible for ensuring safe navigation for maritime transport in Estonia and international waters, integration of the maritime spatial planning studies into the WSM programme is an important engagement for providing co-ordinated decisions on various use of marine areas and resources in the future. Additionally, as graduates of the WSM study programme are often involved during governmental MSP processes and in waterway design process, planning of the sustainable use of inland waters and coastal areas, the knowledge about MSP allows students to establish a link between different sectors, such as industry, government, environmental- and science communities, within the process of planning shipping traffic lanes, management of the coastal areas and harbours. The result of an integration of MSP studies to the WSM programme provides students with a better understanding of the use of water areas by different users, thus allows to develop appropriate management strategies and plans.

As stated previously, MSP is much wider approach than only providing maritime safety and therefore it is important to provide WSM programme students with knowledge about maritime spatial planning. Sufficiently planned waterways minimize potential risks of shipping accidents and spills by providing solid ground of achieving aims of EU Strategy for the Baltic Sea Region (EUSBSR), Water Framework Directive (WFD) and Marine Strategy Framework Directive (MSFD). The EUSBSR [12] intends to increase levels on environmental sustainability, prosperity, accessibility and attractiveness, safety and security meanwhile the WFD [13] intends to achieve and preserve good quality of marine water (up to one nautical mile from shore) and MSFD [14] aims to achieve Good Environmental Status (GES) of the EU's marine waters by 2020.

2.3 Necessary improvement of MSP study course in line with integration to other subjects in the WSM curriculum

The present course of MSP is focused on general description of the maritime spatial planning and does not give enough specific issue, typical for waterway management tasks, such as design of fairways, waterways risk assessment, hydrographic operations etc. In addition, the course is optional and some students do not choose it. As was mentioned above, the curriculum is developed in compliance with IHO S-5 Standard. According to the learning outcomes listed in the standard, student should know the principles of hydrographic data exchange and limitations in use of hydrographic equipment in accordance with environmental regulations. Some of the mandatory topics are included in compulsory courses’ content, but still there is no pronounced relation with MSP. For example, there are some of mandatory courses in WSM study program, e.g. Environmental Impact Assessment and Audit, Environmental Engineering, International Law of the Sea content topics which should be conducted by taking into account the means of MSP principles and vice versa.
In addition, students’ feedback suggests integrating hydrography and waterway management component to the MSP course to establish the link between compulsory courses of the study programme, e.g. course Design of waterways and Hydrographic surveying. First of which is mostly focusing on IALA regulations and guidelines, such as IALA Guideline No. 1058 on the use of simulation as a tool for waterway design and aids to navigation planning and IALA Guideline No. 1078 on the use of aids to navigation in the design of fairways. The aim of the course Hydrographic surveying is to give basic knowledge about the main concepts involved in hydrography, planning and execution of hydrographic surveys and includes a study about methods of hydrographic survey, positioning, sea floor classification and object detection, depth determination, specification of hydrographic surveying and IHO standards regulating hydrographic works. This issue suggests changing the overall approach of teaching MSP as a general subject and incite to develop more specific approach to provide interdisciplinarity.

3. Conclusions

During the past 10 years, MSP has gained considerable importance all around the world, especially in European Union, where the MSP Directive has been adopted aiming to create a common framework for maritime spatial planning in Europe. According to the established MSP Directive, the whole EUs’ sea area should be planned by 2021. Due to the rapid developments of MSP, there is a need for highly qualified specialists who are sufficiently able to contribute during the MSP process. As the graduates of WSM are working for different organizations that are important stakeholders and decision makers during MSP process this research revealed key factors for integration MSP studies to WSM curriculum.

Efficient integration of specific courses’ topics of WSM programme into the MSP studies provide students with broad knowledge on the interconnection of different activities associated with hydrography and waterway management with MSP process. Therefore, the course of MSP should be established as mandatory course for WSM students. Additionally, the hydrography and waterway management component should be integrated into the MSP course to establish the link between compulsory courses of the study programme, e.g. course Design of waterways and Hydrographic surveying. Finally, reciprocal integration between MSP and other mandatory courses, e.g. Environmental Impact Assessment and Audit, Environmental Engineering, International Law of the Sea should be implemented.

References


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