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Cross Border Cooperation for Sustainable Environment Protection

Taner Albayrak¹, Dinu Atodiresei², Catalin Popa^{3*}

¹Faculty of Economics and Administrative Sciences, Dept. of Maritime Business Management, Piri Reis University, Istanbul, Turkey

²Mircea cel Batran Naval Academy, Constanta, Romania

³Mircea cel Batran Naval Academy, Constanta, Romania

*corresponding author: catalin.popa@anmb.ro

Abstract. Oceans, seas, and coastal areas are indispensable component of the Earth's ecosystem and are critical to sustainable development. Protecting the delicate ecosystem of our oceans is vital for the future of the humanity under rapidly increasing use and industrialization of the oceans of the world. Increasing demands and pressures for the use of marine areas have forced managements to deal with problems in a comprehensive and covering multi users' approach. Joint education and research help to raise awareness on environmental challenges and also helps improving common expertise and capabilities in marine-related management, science, technology and engineering. Environmental protection is one of the key unifying problems for cross border cooperation. For example, the problem caused by invasive marine species (IMS) introduced via shipping is one of the largest problems and requires strong cooperation among governments and across sectors. IMS is transferred mainly through ships' ballast water and as fouling organisms. It is a large-scale problem which needs serious and urgent measures to be tackled with. Marine environment is not limited by country borders therefore it is fundamental to establish sustainable forms of cross-border cooperation.

This paper intends to explain the novel approach of a strategic partnership project 'BLUE4SEAS (B4S)' on marine pollution and environment protection based on various joint research initiatives of project partners to set an example for cross- border cooperation for sustainable environment protection.

Keywords: Marine pollution, Environment protection, Research and Innovation, Cross border cooperation, regional measures

1. Introduction

In accordance with the UN Convention on the Law of the Sea (UNCLOS) 1982 (Article 1.4), "pollution of the marine environment" means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities; and "dumping" means: any deliberate disposal

of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea; and any deliberate disposal of vessels, aircraft, platforms [1].

The roots of the blue growth concept can be traced back to the conceptualization of sustainable development (SD). Sustainable development - or the challenge of a sustainable use of natural resources, while at the same time securing economic and social objectives has been a focus of the international community since the 1960s. The growing human population and global industrialization have led to rising production rates of various goods. Many of these products are overly packaged and only used for a short time. Afterwards, they become waste, which litters the environment if not disposed of appropriately. According to various research, a considerable part of this litter ends up in the oceans, either from land-based sources or directly at sea. Shipping and, in particular, fisheries are important sources of litter, as fishing gear is often damaged or lost during operation and left behind. Additionally, large amounts of litter are transported to the sea by rivers. Once litter reaches the marine environment it can only be removed at great efforts, a futile endeavor given the vastness of the oceans. Marine litter is very diverse and comprises items of various shapes, sizes and materials. Owing to the durability of many of the materials used (e.g. plastic, glass), litter accumulates in the ocean. Large amounts of litter have accumulated across all parts of our oceans in less than fifty years. Litter has thus become a serious threat to the marine environment, aquatic life and humankind, whose welfare is closely linked with ocean health. Research on marine litter is currently taking a great leap forward and has substantially increased our knowledge of the amount and composition of litter as well as its impacts on the marine environment, aquatic life and people. However, the sheer number of studies scattered all around the globe has rendered this topic increasingly intangible making it difficult for policy makers, public authorities, media, and the general public to unearth important information needed to address the urgent questions [2] [3].

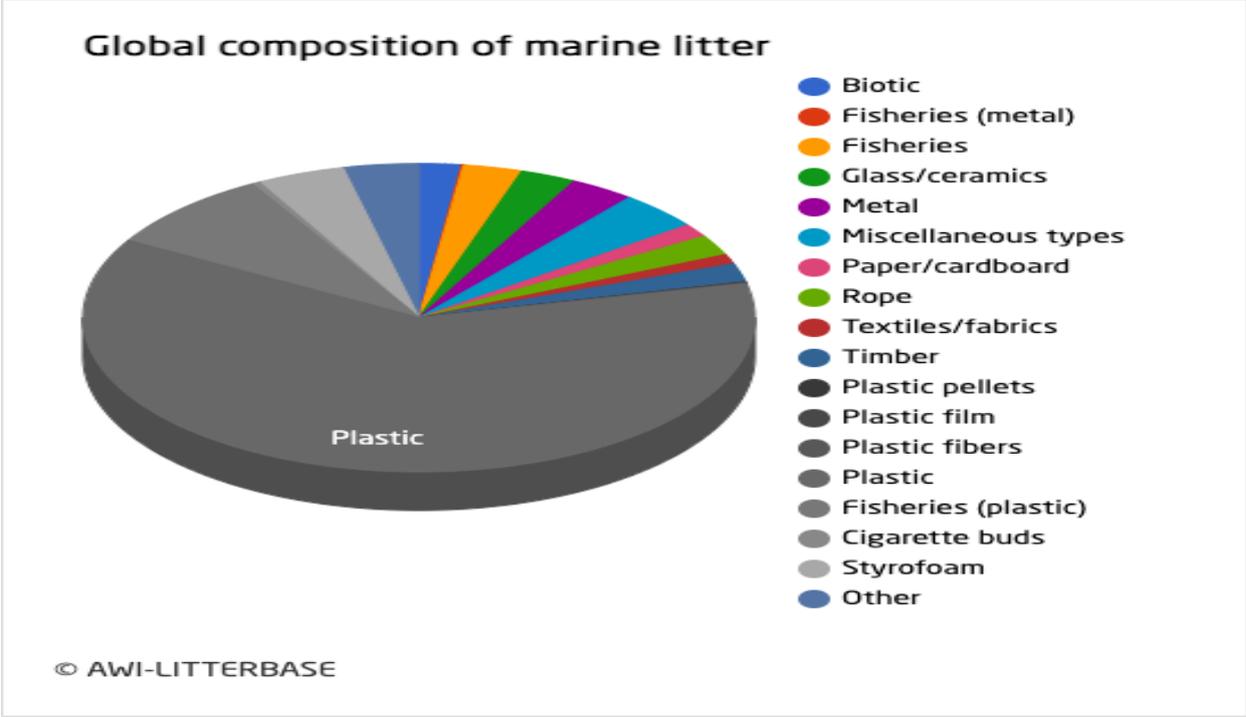


Figure 1: Global Composition of Marine Litter (source litterbase) [2]

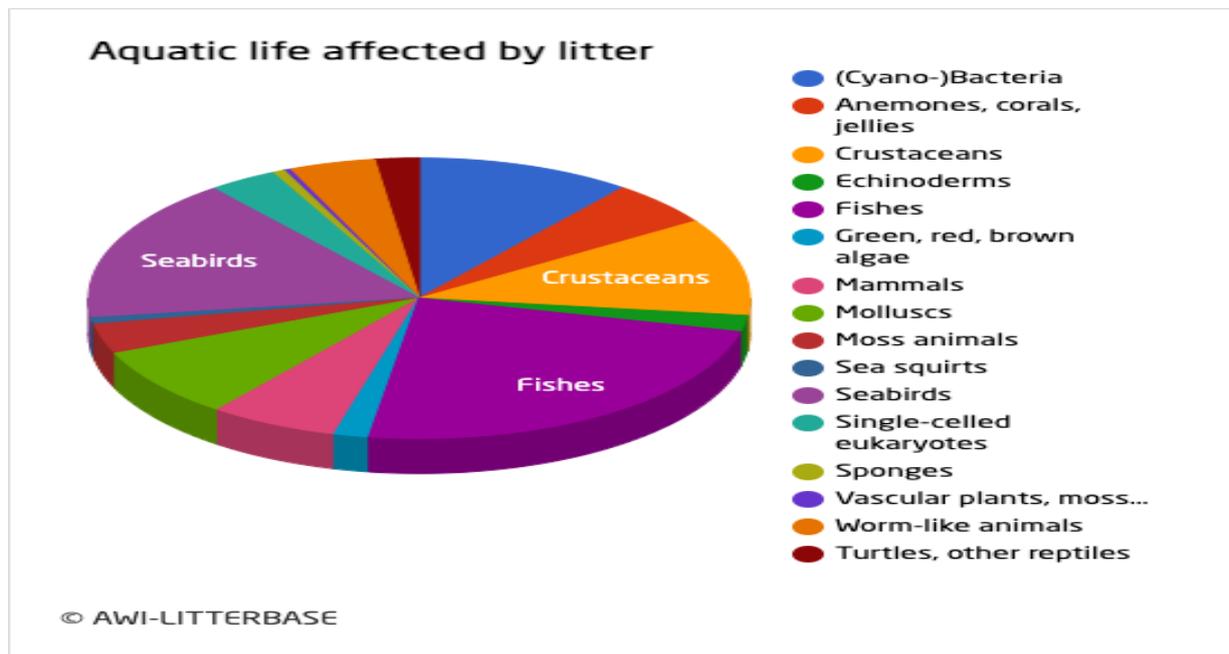


Figure 2: Aquatic Life Affected by Litter (source litterbase) [2]

Overall, the pollution that ends up in the seas and oceans, originates from four distinct sources. A major part of all pollution comes from the land, either through run-off and discharges (via waterways; 44%) or through the atmosphere (33%). Only 12% of all pollution is due to maritime activity and shipping accidents. Dumping of garbage and sewage, as well as the consequences of offshore drilling and mining make up for the rest (resp. 10% and 1%) [4]. Situation in the Black Sea calls for urgent actions. Riparian countries should cooperate for the protection of the Black Sea. Serious sanctions and penalties should be implemented for the polluters of the Black Sea. Permanent measures against pollution should be taken and solutions should be produced [5]. Guideline on Integrated Coastal Zone Management¹ in the Black Sea, sets out the guiding principles of integrated coastal zone management (ICZM) in the Black Sea region and refers to the following considerations: ‘‘The coastal zones of the Black Sea are the common natural and cultural heritage of the peoples of the Black Sea Countries and they should be preserved and used judiciously for the benefit of present and future generations’’ [6].

2. Cooperation for Sustainable Use of the Oceans

Oceans, seas, and coastal areas are indispensable component of the Earth’s ecosystem and are critical to sustainable development. Protecting the delicate ecosystem of our oceans is vital for the future of the humanity under rapidly increasing use and industrialization of the oceans of the world. On-going population growth, technological developments and increased consumer demand have revealed the need for more food, energy and trade. Future projections for the use of marine resources show that this development has not ended and that it is likely to accelerate in the coming years. In the past, traditional uses such as fishing, maritime transport, communications, oil and natural gas production, marine tourism and coastal engineering have been the most prominent uses, but nowadays, new uses such as renewable energy and nature conservation initiatives have emerged. Marine resources are limited in both quantity and space, and the pressure caused by; the rise of existing use, the emergence

¹ ‘Integrated coastal zone management ‘means a dynamic process for the sustainable management and use of coastal zones, taking into account at the same time the fragility of coastal ecosystems and landscapes, the diversity of activities and uses, their interactions, the maritime orientation of certain activities and uses and their impact on both the marine and land parts.

of new areas of use, their confrontation with each other and the environment has been devastating in many places. Increasing demands and pressures for the use of marine areas have forced managements to deal with problems in a comprehensive and covering multi users' approach. The combination of different human activities performed in the oceans requires good planning, cooperation, and innovative approaches, so as to avoid conflicts and to create synergies between users and to protect ecosystem that requires certain level of awareness and common knowledge. Developing joint education programs and research can be a solution to achieve the level of awareness and common knowledge necessary to resolve the problems. Joint education and research help to raise awareness on environmental challenges and also helps improving common expertise and capabilities in marine-related management, science, technology and engineering. Environmental protection is one of the key unifying problems for cross border cooperation. For example, the problem caused by invasive marine species (IMS) introduced via shipping is one of the largest problems and requires strong cooperation among governments and across sectors. IMS is transferred mainly through ships' ballast water and as fouling organisms. It is a large-scale problem which needs serious and urgent measures to be tackled with. Marine environment is not limited by country borders therefore it is fundamental to establish sustainable forms of cross-border cooperation.

Although blue growth has a great deal of potential to secure sustainable use of the oceans, there are some clear challenges. One of the most apparent obstacles is the lack of a common and agreed-upon goal of blue growth. For some, blue growth revolves around maximizing economic growth derived from marine and aquatic resources, but for others it means maximizing inclusive economic growth derived from marine and aquatic resources and at the same time preventing degradation of blue natural capital. This lack of a common understanding may be the reason for the paucity of holistic blue growth strategies and more specific and inclusive goals and milestones that cut across sectors.

Another challenge is interdisciplinarity – and learning how to “speak the same language”. Not only must scientists work together, across their diverse disciplines; but also, scientists must work with policy experts and policy makers, together with other stakeholders who might have even more disparate interpretations of blue growth and other focal terms. Close collaboration with stakeholders is necessary to ensure that research informs and supports viable, integrated, and comprehensive solutions and their implementation. In theory, this seems feasible once the data are in and the conclusions are clear and communicated to the politicians and policy makers.

Identification of knowledge gaps, which clearly depend on one's viewpoint, is another key challenge. What a scientist thinks is a critical knowledge gap may seem inconsequential to the government body deciding what to fund, and an obvious gap in knowledge for a politician that is critical to a policy decision might also be something that scientists are not focused on. Stakeholders in the industry might have a third idea of what are the critical gaps in knowledge that need to be assessed in order to create sustainable businesses. Again, communication is key here, although power imbalances caused by availability of funding must be closely monitored to avoid biased research, and biases in the knowledge that we gain from research.

Another challenge is how to resolve conflicts of interests, which are often rooted in trade-offs between different uses of the ocean space, but also often concern who decides what should be open for public debate. Comprehensive analysis of tradeoffs between different ocean uses requires coordination among and cooperation from very different scientific disciplines and stakeholders. Resolving conflicts between stakeholders is difficult and requires holistic approach to governance.

Despite these challenges, blue growth has the potential to facilitate collaboration and communication among scientists, industry, and politicians and thereby lead to a coordinated effort to combat these challenges [3].

Two Black Sea littoral maritime universities, Mircea Cel Batran Naval Academy/Romania and Piri Reis University/Turkey, that are aware of the importance and awareness of this issue, have developed a novel approach by a strategic partnership project “BLUE4SEAS (B4S)” on marine pollution and

environment protection in the Black Sea based on various joint research initiatives of project partners to set an example for cross-border cooperation for sustainable environment protection. Three other maritime academies from other maritime regions (France, Slovenia and Lithuania) showing similar characteristics were also included in the partnership for benchmarking and exchange of best practices.

3. Methodology

In order to overcome cross-border challenges in fight with marine pollution, BLUE4SEAS project aims to build a strategic partnership between five maritime academic institutions “to bridge” the Baltic, Black Sea, and Mediterranean Sea, to place a “brick” in the foundation of European universities in order to obtain competitive advantages through the exchange of good practices and the exchange of knowledge within the network in improving teaching skills and learning methods through simulation, providing a solid ground for excellence in teaching and skills development processes.

Maritime officers are educated and trained in naval academies and maritime universities and the specific curricula have also to comply with Bologna higher education requirements and their related quality standards. The differences between national education maritime systems can lead to problems with the recognition of educational qualifications from other countries and of periods of study taken abroad. Into the maritime European space BLUE4SEAS will lead to an increase in the competitiveness of maritime higher education institutions (MHEI) providers supporting the implementation of the Bologna principles, implicitly by giving and recognizing ECTS credits and developing a successful European Education Area (EEA).

The protection of environment has now become a topical issue and IMO initiatives provides ample opportunities and catalysts for MET institutions to review their provisions while at same time incorporating changes in STCW requirements. The risks of an incident likely to cause massive pollution by oil or other hazardous substances continues to be high and organized, equipped, well-trained and competent human resources able to cooperate with all stakeholders is absolutely necessary. Regional cooperation and mutual assistance are indispensable when dealing with a major marine pollution accident. Also, in context of current crisis created by COVID 19, it is even more important to focus on developing online courses and creating virtual online simulation platforms. A prerequisite for such cooperation is best practices and knowledge sharing, education, keeping up with new technological achievements and development of information system.

BLUE4SEAS will facilitate the use of the digital technologies and of innovative and open pedagogies in MHEI through virtual online training platform (VOTP) on the environmentally friendly maritime shipping industry as an open source. The innovative educational resources and training facilities developed could be shared as a pilot module to other interested MHEI. The intensive training courses are multidisciplinary (Europass) recognized in all HEI involved in this project, facilitating exchange of students through ERASMUS + programs and flattening the skills gaps and mismatches in maritime education and training system, based on networking with a high potential not only in education but also in research.

These courses will use new innovative tools for teaching, research and innovation to prepare future maritime graduates to deal successfully in increasingly demanding international labor markets. Models and scenarios simulated in teaching activities are based on real-world applications. Courses are based on ICT being designed to be modular; the assessment will be both online and face to face; based on the collaborative practices of all partner universities involved in the project. Target groups teams are made of students/professors from all 5 countries participating in the project. Main objectives of the BLUE4SEAS are:

- Creation of strategic partnership between the 5 MHEI located in countries bordering on three of four seas of the Europe. The creation of Network of research and innovation on maritime environment protection is designed to support academic exchanges, to share knowledge, to promote infrastructure

facilities and research activities between these maritime institutions with aim to be extended at European and international level.

- Enhancing the capacities of MHEI participating in the project through cooperation in the field of marine environment protection with a view to their modernization and internationalization, to promote innovation and to exchange best practices and know-how materialized by the VOTP, common courses with ECTS credits, joint research studies on simulating environment efficiency and effectiveness for maritime education and training, a student competition, video tutorials in order to enhance the learning process by accessing digital resources, common syllabuses and course materials to be harmonized with STCW where the simulators are used, conferences and transnational meetings, and training courses.

Expected impact consists in the logical project's follow-ups which would be the expansion of the common syllabus to joint study programs and also the building of research. BLUE4SEAS results can eventually offer possibility of starting consistent joint degree study programs between the partners and could be replicated at the European and international Maritime Higher Institutions.

The context of the project is addressed to the requirements of the EU in the field of marine safety and security based on the analysis of EMSA within Inventory of EU Member States' Policies and Operational Response Capacities for Hazardous and Noxious Substances Marine Pollution 2013-regarding the situation of FR, RO, SI, LI, and TR in the field of pollution intervention. The protection of environment has now become a topical issue and IMO initiatives provides ample opportunities and catalysts for MET institutions to review their provisions while at the same time incorporating changes in STCW requirements. Safety of life at sea and marine environment (ME) and over 80% of world's trade depends on professionalism and competence of seafarers. In Baltic, Black, and Mediterranean Seas, risks of an incident likely to cause massive pollution by oil or other hazardous substances continues to be high. Regional cooperation and mutual assistance are indispensable when dealing with a major marine pollution accident. Because there is a real chance that this may one day happen on a larger scale, it is necessary consistently to implement all possible preventive measures. Therefore, organized, equipped, well-trained and competent human resources able to cooperate with all stakeholders is necessary. Also, in context of current crisis created by COVID 19, it is even more important to focus on developing online courses and creating virtual online simulation platforms. A prerequisite for such cooperation is best practices and knowledge sharing, education, keeping up with new technological achievements and development of information system.

In the context of global warming, the studies on the maritime higher education and the requirements of the industry, it has been concluded that maritime universities have included course modules that cover IMO and STCW requirements which are introduced in different disciplines. The most pressing issue is to find a solution to harmonize curricula on prevention of the marine environment pollution to facilitate the mobility of students, teachers and researchers through ERASMUS + Programs by the transfer and the recognition of the qualifications and the competences at European level in order to exchange good practices and to be competitive for the labor market. As a result of the studies carried out by the universities involved in the project in relation to the requirements on the labor market and the economic environment, the following directions were identified that ensure the training of the necessary competences for the graduates of marine universities: Marine environment protection, Applied chemistry to prevent marine pollution, Marine environment issues in port operations, Transport and operation of dangerous goods. In this regard, the necessary competencies, skills, and knowledge to be acquired for undergraduate students of the universities participating to the project, correlated with the needs of the labor market and the requirements of employers, business, decision-makers and other stakeholders will be established. Based on this, the new, innovative and multidisciplinary curricula for the common course modules on Marine environment protection will be elaborated, in English language with ECTS. The impact consists in the fact that the results will allow the elaboration in the course modules with ECTS credits and the possibility of introducing them in the

current professional activity of the 5 partners, loading them in VOPT to be taken over by other MHEI, using it producing positive effects on students, as well as MHEI. The positive effects have been achieved by strengthening the capacities of marine education institutions in Romania, France, Slovenia, Lithuania and Turkey to modernize and internationalize them, supporting the transfer and the recognition of the qualifications and the competences at European level, and to enhance the competitiveness of MHEI graduates on the labor market. As a result of the studies carried out by the universities involved in the project in relation to the requirements on the labor market and the economic environment. The course module designed will be introduced on the platform and will be available to all Maritime Higher Education Institutions and can be replicated at European and international level. The course is addressed to students in maritime education and responds to employers and graduates. Graduates of these programs with common knowledge and understanding, who will be working at the key positions at maritime administrations and other relevant organizations, will enhance the cross-border cooperation at the highest possible level.

The intellectual results will be materialized by developing and harmonizing course materials for the common curriculum identified and designed in accordance with the requirements of IMO and STCW correlated with the standards for higher education. Besides courses, video tutorials for "Marine Environmental Protection" will be developed not only to support the course tutorials to enhance the learning process by accessing digital resources but also for various public awareness activities. Positive effects are expected to be achieved by addressing skills gaps in the field of marine pollution prevention and discordance by developing a new, innovative and common English module to meet the learning needs of the students from maritime higher institutions from the countries participating in the project, at the same time relevant to the labor market and the needs of the shipping industry, including better use of multidisciplinary online learning. Courses are designed to allow for more flexible learning, while developing the digital skills of teachers and undergraduate students, and last but not least, allow the acquisition of transferable and digital skills.

The partners will also aim to create a virtual digital e-campus for teachers, researchers and students, to connect the academic community, in order to create the facility of sharing the didactic materials, video-tutorials for simulating learning environment courses and classes, research infrastructure, technical details on simulators and other educational and research facilities, among the partners. The results will consist in:

- 1 virtual advanced distributed learning platform for sharing the course content to the students for specific courses to be developed (course materials, video-tutorial, digital resources);
- 1 virtual collaborative e-campus for teachers and researchers, where the academics to be connected peer-to-peer with their colleagues in the partner campuses, by forum dialogue, sharing the teaching practices and research results in marine environment protection area of knowledge.
- 1 virtual e-section dedicated to promoting the infrastructure facilities where each partner will be able to provide information about the own research infrastructure and the conditions under which research laboratories and infrastructure could be available for interested persons/researching groups, among the partners.

The innovation consists in the genuine idea of an e-campus set up, that will comprise not only the learning materials distribution environment, but also the research infrastructure sharing portal and the peer-to-peer researching forum where to coagulate the entire academic community of the partner universities and cross-border cooperation. The impact is concerning almost 6000 foreseen target audience, but also interested companies for knowledge or engineering transfer in MET education and scientific research to achieve a common teaching and research environment, where the partners to get

access to a larger pool of facilities and resources. The transfer will also comprise the partners network in larger circle of cooperation, contributing to the academic sharing point settlement.

The research and innovation network will be achieved, seeking to fulfill scientific papers valuing the environment software and partners' environmental simulators as research facilities - this paperwork will permit to disseminate the drawn conclusion, within the planned event-conferences. The innovative contributions could comprise effective studies on:

- environmental risk management in naval and port operation and in cargo handling.
- port operation and sustainable development.
- coastal management and maritime integrated policies for environment monitoring.
- environment simulation software or simulators usage in applied scientific research.

As this research area is still very poor approached on international level, the project could contribute to the enlargement of knowledge in the field of marine pollution and environment protection. The implemented research infrastructure network would serve for carrying out specific studies in environmental risk management in naval and port operation and in cargo handling, port operation and sustainable development or coastal management. The interested public will encompass not only project beneficiaries, but also worldwide researchers or interested business entities, proving the international utility of this project, beyond the foreseen academic purposes. The project itself can therefore become a knowledge transfer platform, not only among the Baltic and Black Seas regions, but on international level.

Awareness campaigns will be organized through conferences for dissemination of the intellectual outputs under following topics :

- “Sustainable development in Maritime Industry”,
- “Education connects the seas”,
- “Maritime Academic Bridge from the Baltic, Black Sea, and the Mediterranean Sea”
- “Challenges in the marine industry reflected in education”
- Challenges from the pollution prevention aspects”

The last conference will host the student competition where students will submit an original poster/video/artwork/essay based on the following contest themes: Marine Pollution Prevention; Ballast Water Management; Marine environment issues in port operations; Transport and operation of dangerous goods; Sustainable development policies in the maritime business.

4. Results

After establishing the necessary competencies, skills, and knowledge to be acquired by the MHEI students, the objectives and course structure were established.

4.1. Course Objectives and General Structure

Environmental protection and climate change issues are important especially in the context of shared sea basins. Water pollution, whether from agricultural activities, industrial or urban discharges are

critical problems, exacerbated by risks of marine pollution in regional seas and in the Black Sea. Air pollution is a transboundary issue too in marine areas also due to maritime transport. Dealing with the adverse effects of climate change on the ecosystems, as well as facing sea level rise due to the changing climate are additional considerable challenges. The Black Sea is one of the seas in the world most heavily impacted and polluted by human activities. Environmental issues are equally important on land-borders, particularly in relation to trans-boundary waters (river basins, including groundwater, and lakes), transboundary air pollution (e.g. from industry and the use of solid fuel for domestic heating) and waste management, or shared protected areas.

Main key cross-border challenges related to the pollution of the sea-basin include:

- Eutrophication and nutrient enrichment of inland water
- Change in marine living resources due to a decrease in water quality.
- Chemical pollution in water and air from coastal and shipping activities
- Non-fisheries related mortality factors such as marine pollution
- Environmental protection international cooperation requirements

4.2. The division of work, the tasks leading to the production of the intellectual outputs:

All partners actively took part in collecting the relevant data for the preparation of “New, innovative and multidisciplinary common curriculum on marine environment protection from pollution”.

Firstly, the following subtasks were defined based on the requirements. The subtasks are listed below:

- What should the common curriculum on marine environment protection from pollution include?
- Which competencies, skills, and knowledge students are required to have to successfully follow the courses and implement the outcomes?
- Identifying STCW requirements and seeing if what have been decided upon correlates with them.
- Identifying labour market requirements and seeing how what have been decided can be adapted to the curriculum to meet these requirements.
- Putting the finishing touches on the list and deciding how they can be incorporated into the curriculum.

For the fulfilment of these outputs, the first thing the working group that was assigned for this output was to determine relevant skills on marine environmental protection in accordance with the IMO and STCW requirements.

Next, a common list of the necessary competencies, skills, and knowledge to be acquired were established, correlated with the needs of the labour market and the requirements of employers, business, decision-makers and other stakeholders for designing the new, innovative and multidisciplinary common curriculum on marine environment protection from pollution.

The steps that were taken are listed below:

- Discussions on the common curriculum on marine environment protection from pollution
- Analyses of the necessary competencies, skills, and knowledge
- Correlation of competencies, skills, and knowledge identified with STCW requirements
- Adapting competencies, skills, and knowledge to labour market requirements
- Elaboration of the final list of identified competencies, skills, and knowledge, as a working basis for the common curriculum development.

4.3. Outcomes

After discussions on the common curriculum on marine environment protection from pollution it was decided that the curriculum will have special emphasis on the following topics:

4.3.1. Developing healthy marine and coastal ecosystems

- To ensure protection and sustainability of marine ecosystem

- To address marine pollution and plastic litter
- To support sustainable fisheries and aquaculture
- To support innovative marine research infrastructures
- To encourage production, management and sharing of marine and coastal environmental knowledge

4.3.2. *Raising awareness among public authorities and citizens on marine environmental issues*

- Understand the impact of human activities on marine ecosystem,
- Encourage joint projects on marine environmental protection at all educational levels
- Understand the prevention and response to pollution caused by ships and ports
- Develop educational material on marine ecosystem, promoting the practice of marine litter harvesting and recycling,
- Support research on the challenges related to eutrophication, invasive species, emerging pollutants and litter

4.3.3. *Competencies, skills, and knowledge on marine environment protection:* A comprehensive survey of tertiary education institutions giving courses relevant to the topic have been made and the outcomes were used to determine the necessary competencies, skills and knowledge for the realization of the project.

- Adaptation to new situations
- Autonomous or teamwork with a presentation
- Basic introductory knowledge for fieldwork planning
- Decision-making
- Introduction to environmental concepts
- Production of free, creative and inductive thinking
- Project planning and management
- Respect for the natural environment
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Teamwork.
- Work in an interdisciplinary environment.
- Working independently

Future skills with respect to environmental regulations are also reported within the frame of task. A continuous stream of new technologies is being introduced in the shipping industry to ensure that it meets new operational limitations set by environmental regulations. For example, leading shipping companies (Maersk CMA CGM, MSC and Hapag-Lloyd) team up to drive emission reductions faster than regulators. The CO₂ reduction targets, and new sulphur emission limits are key drivers of these technology developments. As part of regulatory compliance, a few technologies are likely to be improved - for example, hydrodynamics, new fuel and energy sources, logistics, and methods for effective harbour operations. In addition, systems to reduce emissions and particulate matter in harbours and the proximities to cities will be important.

Because of the above changes, the following competences and capabilities will then be needed:

- Logistics and optimisation methods to achieve high utilisation of ships
- Advanced routeing, considering wind, current, and waves
- Operation of complex hybrid and zero emission machineries
- Calculation and documentation of emissions
- Control centres supporting ships with optimisation services, remote control and autonomy
- Performance management systems

4.4. *STCW requirements*

In addition to the survey based on higher education institutions' requirements, STCW requirements were also taken into consideration while determining the competencies, skills, and knowledge on marine environment protection. That means the following topics were studied:

- Ensure Compliance with Pollution Prevention Requirements
- Monitor Compliance with Legislative Requirements
- Precautions to Be Taken To Prevent Pollution of The Marine Environment
- Anti-Pollution Procedures and Associated Equipment
- Control of discharge of oil
- Oil Record Book (Part I – Machinery space operations) and Part II – Cargo/Ballast operations)
- Shipboard Oil Pollution Emergency Plan (SOPEP) including shipboard Marine Pollution Emergency Plans (SMPEP) for Oil and/or Noxious Liquid substances and Vessel Response Plan (VRP).
- Operating procedures of anti-pollution equipment, sewage plant, incinerator, comminutor, ballast water treatment plant
- Volatile Organic Compound (VOC) Management Plan, Garbage Management system, Anti-fouling systems, Ballast Water Management, and their discharge criteria

4.5. Proactive measures to protect the marine environment

In accordance with STCW requirements correlated with the needs of the labour market and the requirements of employers, business, decision-makers and other stakeholders the following topics have been decided to take place in the curriculum development.

Marine Pollution and Environment Protection - Awareness

Definition of Marine Pollution, Overview of marine pollution types, Nature of casualties involving ships (capsizing and listing, collision, contact, fire or explosion, hull failure, etc.), Environmental effects, Pollution risks from vessels in distress: the use of places of refuge, Economic losses from marine pollution, International and regional organizations (Local organizations, National maritime agencies, Classification societies, insurance companies and salvors

Maritime Conventions for Marine Pollution

SOLAS, MARPOL, ISM, London Convention and Protocol, BWM, AFS, Hong Kong Convention, OPRC, CLC, FUND, HNS, BUNKER, laws of wreck and salvage, Anti-fouling Systems Convention, Biofouling guidelines, WHO International Health Regulations, guidelines for recycling of ships and inventory of hazardous materials.

Ocean governance & Management

Area-Based Management of the Ocean and Coasts (Spatial management tools such as ocean zoning, marine protected areas, and marine spatial planning), externality, governance and social perceptions, coastal State obligations, sources of pollution and, the science and technologies for pollution monitoring and control. To interpret IMO instruments related to pollution response and to identify the civil liability and compensation regime for marine pollution damage. contingency planning as part of the overall risk management process, Emission control areas (ECAs), Biosecurity

Ecosystem-based approach

Ecosystem functions and marine resources, sustainable ocean governance and responsible ocean business practice, United Nations 2030 Agenda for Sustainable Development, impacts of climate change and the growing human use, mitigating adverse human impacts and restoring ecosystem function.

Air Pollution and Reduction of GHG

Ship emissions (SO_x, NO_x, particulate matter (PM), volatile organic compounds (VOC)), Greenhouse gases (GHG), Limits in the content of marine fuels, Technical and operational measures, Current

abatement technology solutions for SO_x, NO_x and PM and other substances (Scrubbers, Biofuels, LNG, Energy Efficiency Design Index (EEDI), Ship Energy Efficiency Management Plan (SEEMP))

Ballast Water Management

Environmental threats from the use of ballast water, IMO response to the problem of invasive species, Ballast Water Management Plan, Ballast Water Exchange and Ballast Water Management Record Book, Compliance, Ballast Water Management Techniques and Technologies

Other Marine Pollutants

Anti-fouling systems, chemical pollution, bilge water/waste oil, ship scrapping and recycling, HNS (Hazardous and Noxious Substances): Noxious Liquid Substances (NLS), Harmful Substances in packaged form, Carriage of dangerous goods, Sewage and garbage and the dumping of other material, including waste management operations, Bilge water/waste oil, Ship scrapping and recycling, Noise, Seabed Damages

Oil Pollution and Offshore Activities

Pollution risks in offshore oil and gas operations, Offshore Pollution Liability Association (OPOL) agreement, Oil Spill response, Clean-up strategies, Crisis and media management,

Pollution preparedness and response

Shipboard monitoring, contingency planning, port reception facilities (IMO, EU and national level), the human element, accident investigation and surveys, intervention and minimisation of effects, Documentation, reporting and communication, International Oil Pollution Prevention Certificate and Oil Record Books, Reporting forms for reception facilities, Contingency planning, Vessel response plans

Legal Issues, Insurance and Compensation

Liability and compensation, non-compliance with international regulations.

5. Conclusions

The common curriculum will be consequently detailed in the 4 specific courses. Course on ‘Maritime Pollution and Environment Protection’ was also devised in accordance with agreed outcomes. Devised outcomes and course content are common for all modules. In Unit 1, all outcomes have been responded to but in a limited content at 1–2-hour length topics as an introductory course. It is at responsible partners’ discretion whether to apply the same practice to other courses, or else, only selected parts of the content may be addressed in lengthy topics relevant to each course title. Once the topics of the other courses are determined, the whole package will be reviewed to prevent overlaps and likely repetitions. Final tuning will be also necessary during and after the learning material development.

The proposed curriculum framework in terms of identified learning outcomes and course content which are based on the detailed review of STCW competencies and main conclusions of the benchmarking study, and which are prepared in accordance with the decisions of the transnational project steering committee meeting is attached as the ‘Course General Outline’.

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Annex: Proposed Course General Outline

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