



# REPORT DEV 1.3

**WP1** STATE OF THE ART ON MARITIME ENVIRONMENTAL PROTECTION AND MANAGEMENT

**DEV 1.3** Reporting on actions and model for introduction of new joint interdisciplinary MSc program in MEP&M in English language

Development of Regional Joint Master Program in Maritime Environmental Protection and Management – MEP&M  
Project no. 619239-EPP-1-2020-1-ME-EPPKA2-CBHE-JP

## REPORT ON OVERVIEW OF MSC PROGRAMS IN FIELD OF MEP&M AT EU HEIs

Overview of MSc programs in field of MEP&M at EU HEIs

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## List of abbreviations and acronyms

|       |  |
|-------|--|
| MEP&M | - Maritime Environmental Protection and Management |
| UoM   | - University of Montenegro                         |
| UAMD  | - Aleksander Moisiu University of Durres           |
| UV    | - University 'Ismael Qemali' Vlore                 |
| UL    | - University of Ljubljana                          |
| UCA_F | - Université Côte d'Azur                           |
| UCA_S | - University of Cadiz                              |
| GMD   | - General Maritime Directorate                     |
| EPA   | - Environmental Protection Agency                  |
| ECD   | - Ecological Center DOLPHIN                        |

## 1. Introduction

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Based on the DEV 1.1 and DEV 1.2 overview and analysis, guidelines (report) for delivering a new regional joint interdisciplinary master program in MEP&M in English language at Montenegrin and Albanian HEIs is planned to be delivered by this DEV 1.3. This document serves as the base for future development of the program.

By the project proposal, it is previewed that topics to be taught at MSc MEP&M are:

1. Research skills, methods and tools
2. Fundamentals of (Earth's) environmental science, pollution and sustainable development
3. Blue economy
4. Marine ecology and conservation
5. Marine environmental pollution and prevention
6. GHG emission and climate change mitigation policies
7. Environmental management standards and Impact Assessment
8. Sustainable Development of Maritime transport and ports
9. Sustainable Development of Coastal tourism
10. Management of offshore energy and mineral resources
11. Fisheries management
12. Management of protected marine areas and species
13. Maritime safety and security
14. Integrated Coastal Management
15. Entrepreneurship & Blue Innovation

## 2. Curricula development

**Author(s) of the Chapter #2:** Christophe Mocquet, Université Côte d'Azur (France); Ana Macías Bedoya, University of Cadiz (Spain)

The 120 ECTS MEP&M program is divided into three teaching semesters and a master thesis semester. The first semester should offer an introduction to research, blue growth and environmental science in order to build a solid foundation for further development. The second semester aims to develop skills and knowledge in ecology, conservation, pollution prevention and climate change mitigation. Finally, the third semester should offer students the opportunity to apply this new knowledge in a management perspective and two of the three modules are to be chosen by the students to form their specialization (electives). Next topics/courses should be implemented in joint master degree program MEP&M :

- **Research skills, methods & tools**

Conducting quality research requires practical skills and a particular contextual framework, which are the focus of this introductory module. Emphasis is placed on workshop opportunities to develop and practice skills in research planning and analysis, communication, writing and oral presentation. In addition, data sources, standards, and statistical tools will be introduced, prior to data analysis and representation. Statistical approaches, including factor analysis, will be provided to students to conduct high quality research for the study of the marine environment.

*Keywords: **scientific approach, research planning, database, sampling & experimental design, data analysis, communication.***

- **Fundamentals of environmental science and sustainable development**

A solid foundation in the basic principles and unifying concepts of the environmental sciences is crucial to addressing MEP&M topics. This module covers the major themes of modern environmental science involving humans and sustainability: such as maintaining biodiversity and natural resources; and sustaining environmental quality and human societies. Students will gain an awareness of the importance of Earth systems (atmosphere, hydrosphere, lithosphere, biosphere) in sustaining our daily lives, as well as the scientific foundations and tools necessary to apply critical thinking to contemporary environmental issues, with a particular focus on the United Nations Sustainable Development Goals and their implementation.

*Keywords: **environmental science, sustainable development, society, earth systems, UN SDGs, pollution***

- **Introduction to the Blue Economy**

The emergence of the blue economy highlights the need to integrate multidisciplinary concepts related to exploitable marine resources. The different sectors will be introduced:

fisheries & aquaculture, sustainable coastal tourism, shipping, offshore mineral extraction, and recent developments in bioprospecting and biotechnology in relation to agri-food, pharmaceutical and cosmetic opportunities. The module will address integrated maritime policy, marine spatial planning directive and blue growth policies. The legislative tools concerning the ownership of marine and maritime resources and the main governance systems that govern these properties, including the concepts of intellectual property and value redistribution will also be tackled. Finally, the way these activities are managed and regulated in various regions of the world will be discussed, as well as the opportunities and impacts of these sectors for the development of the economy.

*Keywords: **blue economy, blue growth, fisheries, aquaculture, tourism, shipping, mining, biotechnology, bioprospecting, agri-food, pharmaceutical, cosmetics, policy, marine spatial planning, governance, intellectual property, value redistribution***

- **Marine Ecology & Conservation**

Basic elements of marine ecology on ecosystems and biodiversity are explored, with the main threats posed by human and the main conservation measures. On an ecological point of view, students explore theories and models in marine ecology, understand and identify the main processes and patterns, and identify the similarities and differences between systems. In relation to human development, students also identify and comprehend the main anthropogenic impacts on marine ecosystems, and they identify the most suitable objects for the protection of ecosystems from anthropogenic threats. Finally, on more practical and legal aspects, students learn how to implement the scientific process of creating an MPA and the legal principles governing marine environmental issues at national and European level.

*Keywords: **ecology, conservation, ecosystems, biodiversity, anthropogenic threats, protection, MPA***

- **Marine environmental pollution and prevention**

This module will explore the types and sources of marine contamination and their effects on marine ecosystems, such as eutrophication, sewage and algal blooms, bacterial contamination, ballast water, micro and macro waste, oil pollution and contamination of emerging concerns. The international agreements and conventions for the prevention of marine pollution will be explored together with the legal principles governing marine environmental issues at the national and European level, such as MARPOL, BWMC and the AFS Convention. Tools for monitoring and reporting pollution will be provided, such as Environmental Risk Assessment, Environmental Sensitivity Maps and Contingency Plans for contamination episodes. Finally, strategies for bioremediation of marine environmental pollution will be discussed.

*Keywords: **marine pollution, contamination, eutrophication, prevention, monitoring, risk assessment, contingency, bioremediation***

- **GHG emission and climate change mitigation policies**

This module covers the scientific, legal and societal aspects of climate change. First, students will examine the science of climate change, the physics of the greenhouse effect, the current state of the descriptors (GHG, temperature, water...), and the expected consequences of the latest IPCC reports. The international legal and political framework of climate change will also be discussed, especially regarding shared responsibilities and ongoing discussions and the history of emissions. A particular focus will be brought on how to react, both on mitigation and adaptation. Mitigation, which aims at reducing greenhouse gas emissions and carbon sequestration, notably through nature-based solutions. And adaptation, which aims to reduce the vulnerability of natural and human systems against the effects of climate change, and thus to safeguard our societies. The issue of financing climate change will be addressed, both in terms of financing response mechanisms and the cost of the consequences. All these elements will be put into perspective in the context of climate change planning.

*Keywords: **climate change, greenhouse effect, temperature, IPCC, mitigation, adaptation, carbon sequestration, nature-based solution, climate finance, climate change planning***

- **Environmental management standards and Impact Assessment**

The module is designed to introduce the ISO 14000 series of environmental management standards and the concepts, procedures, and methodology of environmental impact assessment (EIA). Students will be invited to develop a critical awareness of the factors affecting the use of EIA as a part of project management in the legislative and regulatory context of newly industrialized and less industrialized countries. This module will expose students to the need for environmental impact assessments and how to prepare the various documents required by state and federal regulations. Environmental risk assessment processes for contaminants will be explained as well as analytical methodologies and implementation of quality standards.

*Keywords: **environmental impact assessment, EIA, ISO 14000, environmental management standards, environmental risk assessment, quality***

- **Sustainable Development of Maritime transport and ports**

The state of the art of maritime transport of goods and people will be exposed and shipping will be discussed as a source of contamination of marine ecosystems. The environmental risk assessment of anthropogenic discharges from shipping will be addressed, integrating the regulatory framework of wastewater discharges from cruises. Bioremediation aspects of shipping wastewater discharges will be addressed, as well as sustainable water services in port areas (water supply) and sustainable waste services. The transition to green shipping and decarbonization will be discussed extensively, including fuel and related emissions (Sulphur Directive), but also offsetting solutions integrating nature-based solutions. Finally, this module will develop economic, social and

environmental indicators for EU ports, sustainability indexes and international conventions in place.

*Keywords: maritime transport, shipping, cruise, wastewater, bioremediation, waste, transition, offset, nature-based solution, port*

- **Sustainable Development of Coastal tourism**

The concept of sustainable tourism, particularly as applied to coastal areas, is developed in this module. The spatial expression of tourism developments in coastal areas is addressed, in particular to measure the dimension of the phenomenon. Furthermore, the economic, social and environmental consequences of the "sun and beach" tourism model are discussed. Furthermore, this module details territorial planning, an instrument for the sustainable management of tourism developments in coastal areas, and landscape management as a tourism resource. Finally, the place of tourism in protected natural areas will be discussed, with a particular focus on integrated planning and management of tourism in coastal areas. Case studies, recitations and recommendations are made by the students.

*Keywords: maritime transport, shipping, cruise, wastewater, bioremediation, waste, transition, offset, nature-based solution, port*

- **Management of offshore energy and mineral resources**

This module introduces students to the study of marine mineral resources, with a focus on soil and subsoil exploration and prospecting techniques; mineral evaluation and exploitation methods. The aspects related to energy resources in marine sedimentary basins are addressed, notably through petroleum systems, hydrated gases, and the sustainability of exploration and exploitation of hydrocarbons. The mineral resources are explored, both on continental margins on the ocean basins. Finally, a particular focus is proposed on the role of offshore energy in Europe, and its description through the analysis of the Marine Spatial Planning (MSP) initiatives of different countries. Case studies, recitations and recommendations are made by the students.

*Keywords: mineral resources, soil, exploration, prospection, exploitation, energy, petroleum, hydrated gas, hydrocarbons, offshore, marine spatial planning*

- **Fisheries management**

This module provides basic knowledge on the biology and population dynamics of fishery resources, on the selectivity of fishing gears and on the mapping of fishery resources. Students will acquire skills in assessment methods for the development and analysis of fisheries resources, always with a view to sustainable fisheries management. Students determine the status and productivity of a fishery resource and the impact of fishing on that resource and the environment. This module aims to develop some knowledge as real as possible of the state of exploitation and the evolution of the resource, by



understanding the dynamics of the exploited populations. Case studies, recitations and recommendations are made by the students.

*Keywords: fish biology, fisheries, population dynamics, fishing gears, sustainable fisheries management, model*

- **Integrated Coastal Management**

The conceptual aspects, principles, foundations and objectives of ICZM and marine spatial planning (MSP) are developed in this module. The integration of the physical-natural, socio-economic and legal-administrative dimensions of coastal areas for sustainability is considered. In addition, the management of interactions between terrestrial, marine and river spaces in the coastal zone is addressed. In a more applied manner, this module explores techniques, tools and mechanisms for problem analysis, planning, decision making, management and monitoring implementation of decision making, and public participation. Case studies, recitations and recommendations are made by the students.

*Keywords: fish biology, fisheries, population dynamics, fishing gears, sustainable fisheries management, model*

- **Management of protected marine areas and species**

Threat assessment systems for marine species are discussed in this module, including the IUCN Red List of Threatened Species and the Green List of Protected and Conserved Areas. The various protection instruments are detailed, including the marine protected area networks, Natura 2000, the OSPAR networks, and the UNEP SPAMI list. A description of the MPA governance framework (European framework) is proposed and the place of MPA protection in the Marine Strategy Directive and in Marine Spatial Planning (MSP) is discussed. Finally, students reflect on the establishment of MPA management plans through case studies. Case studies, recitations and recommendations are made by the students.

*Keywords: threat assessment, IUCN, Marine Protected Area, MPA, Natura 2000, OSPAR, SPAMI, Marine Spatial Planning, management plan, business plan*

- **Maritime safety and security**

The development of blue growth and in particular maritime navigation must be based on the assurance of a secure maritime space. This module focuses on the globalization of maritime transport. The international conventions are explained, such as MARPOL, SOLAS, MLC, STCW and CLC. The opposition between traditional and open registries (flag of convenience) are discussed, as well as the role of classification societies, the notion of flag state versus port state and port state control. Case studies, recitations and recommendations are made by the students.

*Keywords: maritime safety, security, maritime transport, MARPOL, flag, flag state, port state*

- **Entrepreneurship & Blue Innovation**

The emergence of blue growth requires innovation, and therefore entrepreneurship. This module aims to provide the necessary skills to identify and evaluate business opportunities in sectors such as aquaculture, fishing, offshore industries, shipping, biotechnology, or tourism. It should also enable students to identify and evaluate public and private resources available for the development of a start-up, and to apply the knowledge acquired to the development of an innovative project. Putting all these issues into perspective requires developing an awareness of the environmental and social issues that arise from maritime activities.

*Keywords: **blue growth, innovation, entrepreneurship, business opportunity, start-up, financing, social responsibility, sustainable business model***

### 3. Distance Learning teaching technology and methodology

**Author(s) of the Chapter #3:** Marko Papić, Sanja Jedrinović, University of Ljubljana; Christophe Mocquet, Université Côte d'Azur (France).

#### 3.1 Learning Methodology

The Covid-19 situation has dramatically accelerated the introduction of digital technologies in the pedagogical process, with the focus on distance learning. After the first months of "putting out" the fire brought by using available distance learning solutions and technologies, pedagogues had the opportunity to reflect and take a thoughtful approach to plan an effective and quality distance learning pedagogical process. Therefore, distance learning should be one of the digital competencies, teachers need to face the challenges ahead successfully.

When we talk about distance learning, it is essential to consider the possibilities **of actively involving students** in the pedagogical process. We want to avoid situations such as passively watching recorded (long) video lectures and encourage students to participate, co-create, discuss, and self-evaluate their knowledge.

Some of the starting points on which to base distance learning are:

- Focus on active-learning techniques rather than passive methods.
- Diverse distance learning activities to stimulate student motivation.
- Offer ungraded or anonymous quizzes to improve understanding and engagement.
- Offer more interactive sessions to avoid fatigue.
- Combine synchronous and asynchronous learning formats.

With this in mind, we have drawn up guidelines for introducing distance learning. When preparing the guidelines, we have categorized them according to selected areas of the European Digital Competence Framework for Educators (DigCompEdu).

#### **Area 1: Digital resources**

Distance learning should focus on using ICT for the effective and responsible use, creation, modification and sharing of digital resources. Such resources include databases, animations, simulations, videos, quizzes, interactive presentations, collaborative whiteboards, which the teacher can prepare prior to the teaching process or by involving students in the actual production. The teacher can provide access to the prepared resources through a collaborative learning environment (the Learning Management System Moodle is proposed).

#### **Area 2: Learning and teaching**

In distance learning, it makes sense to introduce innovative forms of teaching that encourage active engagement of the student. In this way, distance learning can include:

- Inquiry-based learning supported by the use of ICT

- Collaborative learning supported by the use of ICT
- Project-based learning supported by the use of ICT
- Problem-based learning supported by the use of ICT
- Experiential learning supported by the use of ICT

### **Area 3: Assessment and evaluation**

In implementing distance learning, particular emphasis should be placed on the **evaluation of student learning**. In addition to summative assessment, which we are used to from traditional teaching methods, more emphasis should be placed on the online formative assessment of students' knowledge. We can use different ICT to support summative assessment (e.g. Moodle, Exam.net) or formative assessment (e.g. Moodle, Exam.net, Padlet, Quizizz, Kahoot, Formative, Socrative, H5P).

Since the common MEP&M MSc program will be performed by three different universities in different locations and the students might have limitations in terms of availability for presence in the live lectures, it can be presumed that the learning process will consist of combination of the following modalities:

- Prerecorded lectures, desirably combined with the interactive multimedia elements (using H5P technology) and additional online material, fostering innovative forms of teaching presented above and used with students in the collaborative learning environment, considering online formative assessment as well.
- Live, face-to-face lectures, recorded for students unavailable to participate or for subsequent learning.
- Hybrid lectures, performed face-to-face, but enabling interactivity with remote students (e.g. present in classrooms in other universities or from home), using videoconferencing tools.
- Recorded laboratory work, combining with remote laboratory work, using collaborative learning environment or subject specific simulation tools where available.
- Online learning material only, used in the collaborative learning environment, fostering innovative forms of teaching.

The teaching modules within the MEP&M MSc program will be designed following a **blended-learning approach**. Materials for the learning process, following modalities presented above, may be articulated in learning blocks allowing students to prepare for their face-to-face interactions with instructors through prior asynchronous work.

- Learning blocks therefore can be composed of short videos (Video capsules), self-paced student activities fostering innovative forms of teaching, and checkpoints for students to assess their learning progress (formative assessment).
- Face-to-face interactions are thus reinforced and enriched by constructive exchanges in the form of recitation, workshops and discussions.

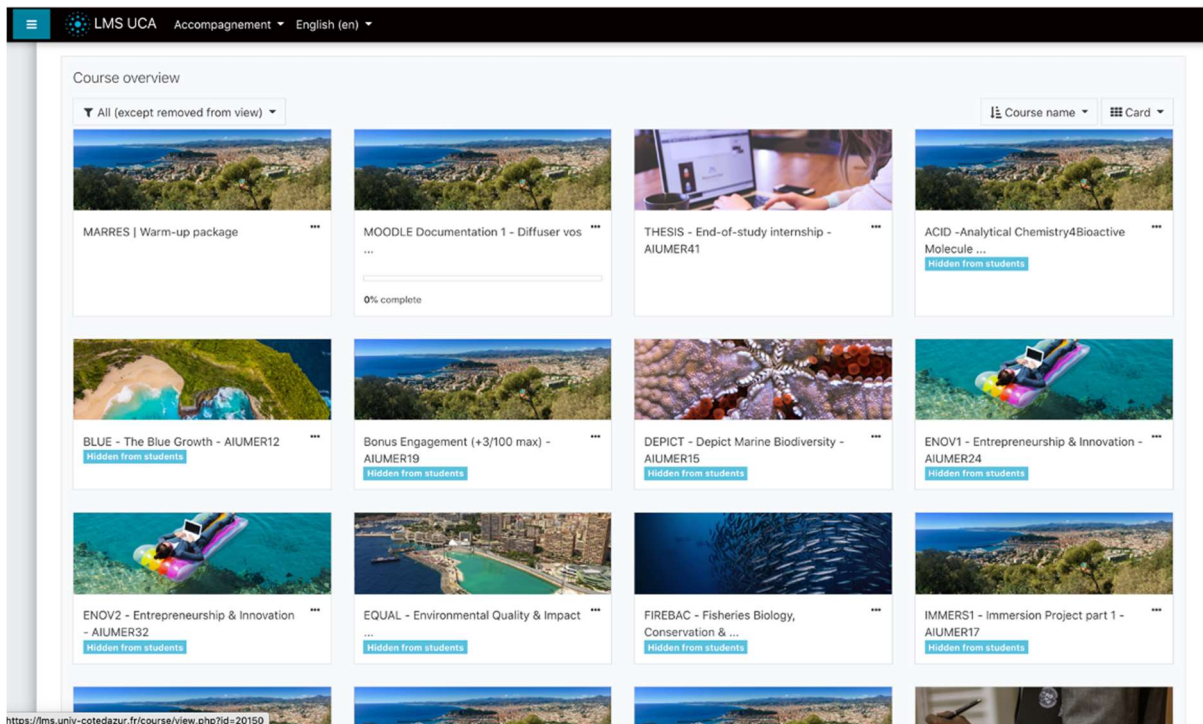
We propose to **avoid long recorded lectures** as the core content as much as possible, especially when prerecording learning material. Instead of prerecording video lectures in advance, with a duration longer than 10 minutes, we propose to use shorter videos, combined with interactive multimedia elements, as already mentioned, also called video capsules in this chapter. Whether for full-online or on-site students, video capsules should be at the heart of the blended-learning approach of the MEP&M program. Lectures are usually taught via these short interactive videos, each corresponding to a key notion. Instructors can choose to directly insert external content such as videos and short quizzes.

### 3.2 Learning Technologies

The methodology presented above need to be supported with the selected technologies, considering limitations and specifics of Western Balkan university MEP&M partners, especially in terms of available resources (human as well as financial) and MEP&M project orientation towards using open source, license free solutions as much as possible.

The MEP&M MSc program can be viewed as the blended learning program. Pedagogues will select the scenario that is most suitable for their specific subject, **in terms of technologies and equipment used** it is important to support the following:

- **Multimedia equipment bundle** (consisting of specified cameras, audio, cabling or network based, appropriate simple or more complex hardware), enabling recording of the lectures, video clips, laboratory work, etc.
- **Recording software**, used to capture different video sources, possibly connect to the videoconferencing system used, locally store the content, upload the content to the repository if required and most importantly, it will consist of a simple dashboard for pedagogues to select the setup (which cameras, slideshow, or similar) they will use and start the recording in the simplest possible way.
- **Collaborative learning environment**, the proposed common Learning Management System is open-source solution **Moodle**. Many international universities have chosen Moodle as their primary LMS. All learning materials for MEP&M MSc program should be fully deployed on there: all course documents, activities, video conference links, workshops, exams, grades... This provides a unified approach to developing a flexible student experience, and agile administrative (registration...) and academic (grades, monitoring of student progress through learning stages, faculty/student exchanges) management.
- **Video conferencing tool with the multimedia repository**: BigBlueButton, open-source solution is proposed to avoid any licensing fees. All face-to-face discussions, hybrid lectures and other interactions/exchanges between pedagogues and students can take place via video conferencing tool integrated with Moodle as well as with recording software presented above.



*Example of the courses in the collaborative learning environment Moodle, (used here for the MSc MARRES) combining all the modules together. All the MSc program modules could be fully deployed on there: all course documents, activities, video conference links, workshops, exams, grades*



*Example of use of videoconferencing tool in a distant face-to-face. In this example, all the students are distant and the pedagogue is using the two screens to fully interact with them and his presentation. In other examples, the pedagogue is with on-site students in the classroom and distant students on zoom. One screen displays the distant student so that they can interact with the on-site class, the other screen displays the pedagogue's documents.*

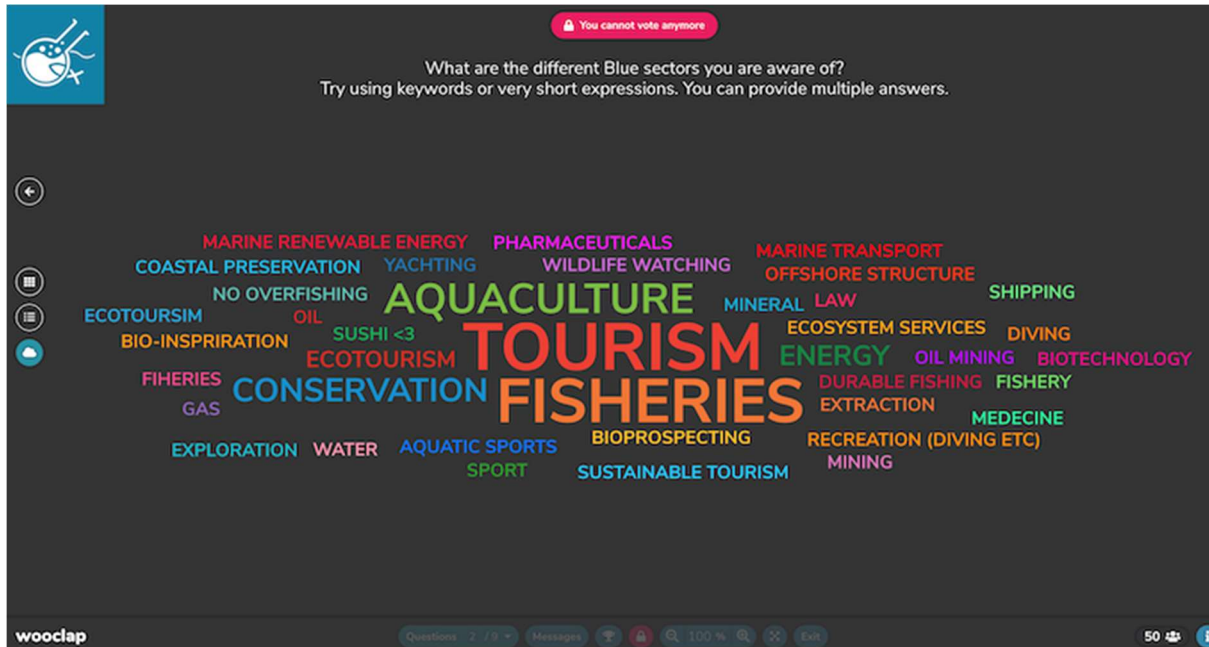
Since the lectures are going to be performed in different classrooms, lecture halls across all three universities, we propose to install the **common mobile multimedia equipment bundles** for each of the three universities, consisting of necessary video, audio, and other equipment. These mobile setups will be stored in the cabinet with wheels, so that it can be easily transferred from one lecture hall to other lecture halls and connected to already existing equipment in the lecture hall, such as the projector. Except from the camera and microphones, the rest of the equipment will stay in the cabinet, so that the process of preparing for the lecture will be fast and simple.



*Examples of multimedia equipment that will be consisted in the mobile multimedia bundles.*

Additionally, we propose to use additional online tools, fostering active participation of students during on-site or online learning, such as Mentimeter or similar, using smartphones or tablets. Pedagogues can perform quick polls or ask questions, allowing them to check the understanding or knowledge gained by the students, during the performance of live lectures. Laboratory work as well as field trips will represent an important part of the learning process. Although the nature of the laboratory exercises is such that most of them require on site participation, we propose to use technological solutions to either perform remote laboratory work, or to digitize the experience for students unavailable to attend whenever possible. This can be achieved by using mobile multimedia equipment bundles with additional equipment

for field trips (e.g. aerial, submarine drones) in combination with different possibilities of presenting the content (360 video, VR/AR, commercially available platforms, such as Thinglink or similar).



*Example of use of online tool, such as Mentimeter or similar. Before the lecture, the pedagogue asks the students what they already know on the subject to react according to this pre-existing knowledge. Students can answer live with their laptop and smartphone, onsite and online at the same time. Such activity can be done after the lesson to check the knowledge acquisition and come back on imperfectly understood topics.*



#### 4. Concluding remarks

**Author of Concluding remarks:** Srdjan Redzepagic, Université Côte d'Azur (France)

The methodology for curriculum development is based on guidelines developed in DEV 1.3. In the process of preparation of all issues, it is taken in consideration the synchronization with Bologna Declaration, Lisbon Strategy, national and EU laws and strategies in the field of MEP&M.

Structure of the program: The MSc in MEP&M curriculum should provide theoretical and practical training for the students and professionals. The program has a duration of 24 months divided into 3 course-based semesters and 1 Master thesis semester. An ECTS unit corresponds to 30 hours of study according to the European Credit Transfer System. Each semester allows 30 ECTS to be gained. The first two semesters are based on compulsory courses, that provide the basis for the specialization pathway through elective courses each student is able to choose in the third semester.

Four types of courses will be offered by the curriculum:

1. Introductory courses with total of 30 ECTS. These courses are compulsory for all students and are taught in the 1<sup>st</sup> semester. They provide core knowledge for the various topics in: research methodologies, advanced statistics, personal development and principles of sustainable development in Blue economy sector.
2. Fundamental courses with total of 30 ECTS. These courses are compulsory for all students and are taught in the 2<sup>nd</sup> semester. They provide fundamental knowledge for the various general MEP&M topics, such as: environmental policy and legislative framework, marine ecosystems, maritime safety and security, and principles of environmental management.
3. Elective specialization courses with total of 30 ECTS. Students are able to select such courses from a list of options for gaining deeper knowledge on a specific topic of MEP&M. They are provided in the 3<sup>rd</sup> semester. Courses are covering topics in oceans and climate change, environmental management, coastal zone management, marine pollution and prevention from various sources including but not limited to coastal and nautical tourism, cruise ship tourism, industry including shipbuilding and ship repairing, shipping, merchant port activities, offshore explorations, seafood farming etc.
4. The last semester is dedicated to the Master Thesis with 30 ECTS, which is a project-based dissertation in one of the research areas of the curriculum. The research-based pathway enables students to plan and conduct in a professional and ethical manner, produce and disseminate good quality research to solve environmental problems and issues.

The outcomes of the DEV 1.3 will be used as guidelines for developing MSc in MEP&M curricula with course catalogues. Course catalogues will cover: aim of the module; expected learning outcomes in terms of knowledge, skills, competencies; proposed training methods;



duration; ECTS assigned; methods and criteria for learner's assessment; resources; suggested lecturers; etc. This will be further work of the project tasks.