



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 Durrës
UV	- University 'Ismail 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

Author(s) of Introduction: Srdjan Redzepagic, Université Côte d'Azur (France)

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. Each teaching semester is composed of 3 modules. The first semester offers 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 offers 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).

SEMESTER 1

This three-module semester aims at building a knowledge and skill foundation in research development, environmental science and Blue growth for the further development of the MEP&M themes

- **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.

Credits: 10 ECTS

Type: mandatory

- **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

Credits: 10 ECTS

Type: mandatory

- **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

Credits: 10 ECTS

Type: mandatory

SEMESTER 2

The second semester aims to develop knowledge and practical skills in ecology, conservation, pollution prevention and climate change mitigation.

- **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

Credits: 10 ECTS

Type: mandatory

- **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

Credits: 10 ECTS

Type: mandatory

- **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

Credits: 10 ECTS

Type: mandatory

SEMESTER 3

The third semester allows students to apply their knowledge and skills in a management perspective. Two of the three courses are electives.

- **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

Credits: 10 ECTS

Type: mandatory

List of elective courses (students choose 2 of them):

- **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

Credits: 10 ECTS

Type: elective

- **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

Credits: 10 ECTS

Type: elective

- **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

Credits: 10 ECTS

Type: elective

- **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

Credits: 10 ECTS

Type: elective

- **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

Credits: 10 ECTS

Type: elective

- **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

Credits: 10 ECTS

Type: elective

- **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

Credits: 10 ECTS

Type: elective

- **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

Credits: 10 ECTS

Type: elective

SEMESTER 4

The fourth and final semester consists of a 6-month internship aimed at applying the skills and knowledge acquired and serving as a springboard for the continuation of the academic adventure and/or the beginning of the student's professional career.

3. Distance Learning teaching technology and methodology

Author(s) of the Chapter #3: Christophe Mocquet, Université Côte d'Azur (France).

In order to make the most of the development of innovative pedagogy, it is proposed to develop a hybrid approach combining face-to-face exchanges, prepared by online material. The face-to-face exchanges will also be made available remotely and recorded for later consultation.

Our teaching modules should be designed following a **blended-learning approach** articulated in learning blocks allowing students to prepare for their face-to-face interactions with instructors through prior asynchronous work.

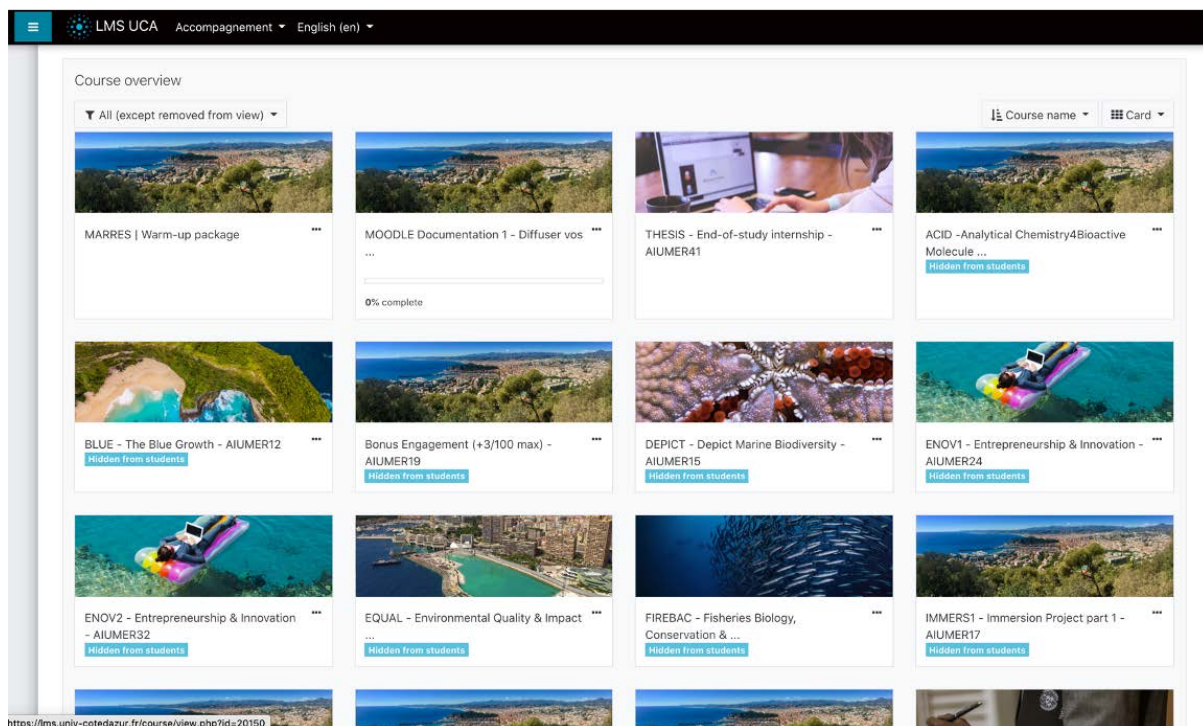
- **Learning blocks are composed of short video capsules, self-paced preparatory activities, and checkpoints for students to assess their learning progress.**
- **Face-to-face interactions are thus reinforced and enriched by constructive exchanges in the form of recitation, workshops and discussions.**

Online solutions

Whether for online or onsite students, the interactive digital tools should be used to optimize the student learning experience. Illustrations are provided at the end of this part to better understand the use of the proposed solutions.

- **Elearning platform** (suggested Moodle). Many international universities have chosen Moodle as their primary e-learning platform. All our modules 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 capsules** (suggested Panopto). Whether for full-online or on-site students, video capsules should be at the heart of the blended-learning approach of the MEP&M modules. Lectures are usually taught via these short interactive videos, each corresponding to a key notion. The Panopto platform allows students to navigate through these videos thanks to menus by slide, by topic, to search for key words, to adjust the size of the different windows, to take notes synchronized with the video, to engage in a discussion with the teacher and the students. Instructors can choose to directly insert external content such as videos and short quizzes.
- **Recitations** (suggested Wooclap). Before or after the video capsules, instructors can choose to test preliminary knowledge or knowledge acquisition via a live exchange platform (on-site and online at the same time) using smartphones and tablets called Wooclap. For example, it can allow instructors to see which parts to review in priority during recitations (those face-to-face moments after a set of video capsules). It also allows to create polls and to let students ask questions during presentations.

- **Online face-to-face** (suggested Zoom). The video capsules do not replace the teacher, at the opposite they allow to better prepare for face-to-face discussions. These exchanges should be done on-site as much as possible, but depending on local and international health conditions and on the needs of each participant, these exchanges can also take place via video conferencing tools. We recommend Zoom which is the most agile and reactive solution tried up to know, able to be used on two screens (instructor and supporting documents separately) and that can be integrated on Moodle. Big Blue Button and Teams are also largely used in Higher Education but they offer less agility.
- **Lab & Field trips** (suggested Thinglink). Field trips and labs are important moments in the students' learning path. For those who cannot join us on site for all these events, an online toolkit could be available. For example, a field trip could be partly digitized thanks to the Thinglink platform which allows students to immerse themselves in the place. Aerial and submarine drone shots can allow students to participate in the analysis of the results from a distance. We agree, nothing will replace being able to jump in the water, but we can try to do our best.



Course overview

▼ All (except removed from view) ▼

Course name ▼ Card ▼

MARRES | Warm-up package ***

MOODLE Documentation 1 - Diffuser vos ***
0% complete

THESIS - End-of-study internship - AIUMER41 ***

ACID - Analytical Chemistry4Bioactive Molecule ...
Hidden from students

BLUE - The Blue Growth - AIUMER12 ***
Hidden from students

Bonus Engagement (+3/100 max) - AIUMER19 ***
Hidden from students

DEPICT - Depict Marine Biodiversity - AIUMER15 ***
Hidden from students

ENOV1 - Entrepreneurship & Innovation - AIUMER24 ***
Hidden from students

ENOV2 - Entrepreneurship & Innovation - AIUMER32 ***
Hidden from students

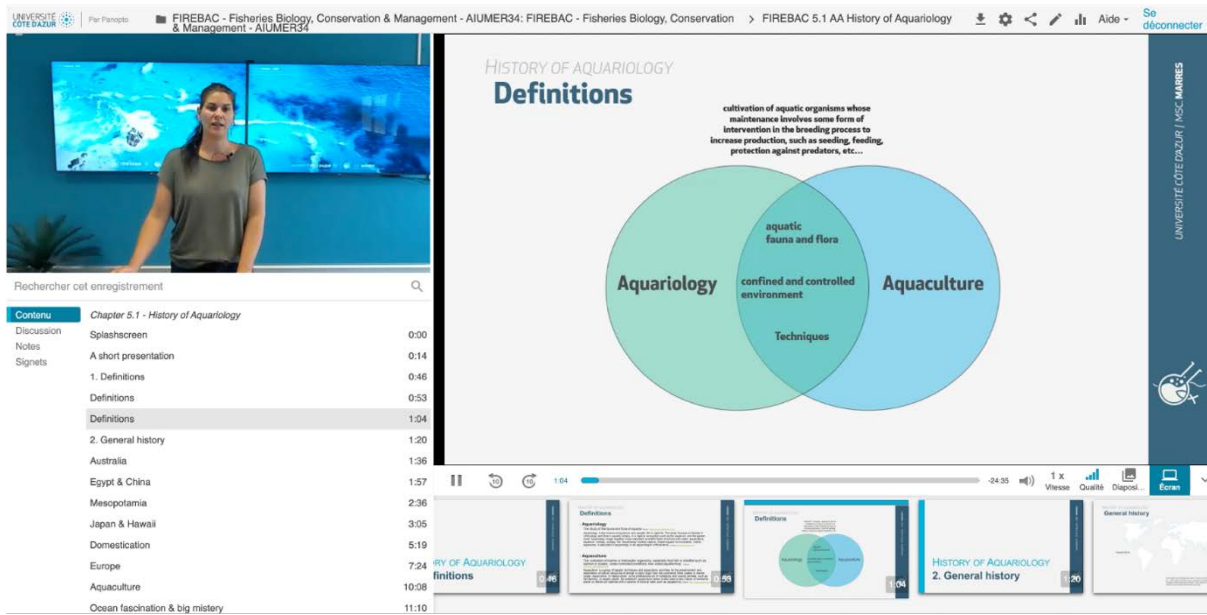
EQUAL - Environmental Quality & Impact ***
Hidden from students

FIREBAC - Fisheries Biology, Conservation & ...
Hidden from students

IMMERS1 - Immersion Project part 1 - AIUMER17 ***
Hidden from students

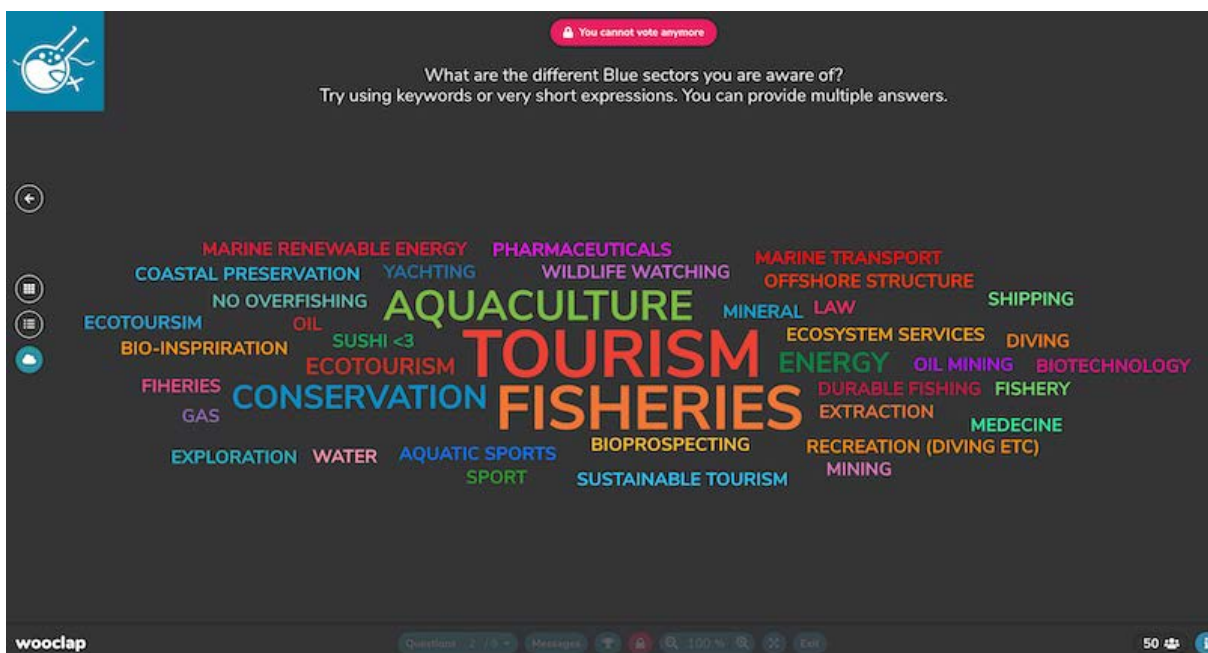
<https://lms.univ-cotedazur.fr/course/view.php?id=20150>

Example of elearning platform (Moodle, used here for the MSc MARRES) combining all the modules together. All our modules could be fully deployed on there: all course documents, activities, video conference links, workshops, exams, grades



Contenu	Chapter 5.1 - History of Aquariology	0:00
Discussion	Splashscreen	0:00
Notes	A short presentation	0:14
Signets	1. Definitions	0:46
	Definitions	0:53
	Definitions	1:04
	2. General history	1:20
	Australia	1:36
	Egypt & China	1:57
	Mesopotamia	2:36
	Japan & Hawaii	3:05
	Domestication	5:19
	Europe	7:24
	Aquaculture	10:08
	Ocean fascination & big mystery	11:10

Example of video capsule using the Panopto solution (here in a class with Aldine Amiel, MSc MARRES, Université Côte d'Azur). The Panopto platform allows students to navigate through the short videos thanks to menus by slide, by topic, to search for key words, to adjust the size of the different windows, to take notes synchronized with the video, to engage in a discussion with the teacher and the student, to ask questions to students...



woodlap






Example of use of Wooclap in a recitation. Before the lecture, the instructor 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 (recitation) to check the knowledge acquisition and come back on unperfectly understood topics.



Example of use of Zoom in a distant face-to-face. In this example, all the students are distant and the teacher is using the two screens to fully interact with them and his presentation. In other examples, the instructor 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 instructor's documents.

| SK 3.9



-  Site information
-  Surface view
-  Underwater view
-  Last results
-  Last observers

Example of use of Thinglink to create an immersive representation of a field trip at sea in the Lerins archipelago, close to Cannes, France. Students can use this online package as a preparation, or a replacement if they are unable to join.

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 1st 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 2nd 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 3rd 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.