

Report

WP 3 CAPACITY BUILDING THROUGH STAFF TRAINING AND EQUIPMENT PURCHASE. THE AIM OF WP2 IS TO ENHANCE CAPACITIES RELATED TO FIELD OF MEP&M AND E-LEARNING.

DEV 3.4.2: KNOW-HOW TRANSFER RELATED TO THE LATEST TOPICS IN CLIMATE CHANGE AND MARINE POLLUTION EFFECTS ON MARINE ECOSYSTEMS

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 KNOW-HOW TRANSFER RELATED TO THE LATEST TOPICS ON
MARINE AND COASTAL POLLUTION AND EMISSION OF GHG FROM SHIPPING,
NAUTICAL TOURISM, COASTAL TOURISM AND OFF-SHORE ACTIVITIES**

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

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1. Introduction

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1.1. Objective and format

In the project, the main objective of DEV.3.4.2 was to provide to Montenegrin and Albanian HEIs' teaching staff additional know-how with research activities in topics of climate change and marine pollution effects on marine ecosystems.

Based on this, the specific objectives to be achieved in DEV.3.4.2 are the following:

- Obj. 1** To increase knowledge on tools for the analysis the pollutants in the marine environment; especially those generated by the activities of maritime transport.
- Obj. 2** To be introduced to the analysis of hazards and risks related to pollution
- Obj. 3** To know the UN Sustainable Development Goals, focus on SDG 13 (climate) and SDG 14 (Ocean).
- Obj. 4** To be introduced to climate change and ocean acidification.

Based on this, the format of DEV.3.4.2. were developed through specific topics, which were developed in the training sessions. Thus, the topics proposed for DEV.3.4.2 are as follows:

- **Topic 1.** Main pollutants in the marine environment and some tools for their analysis
- **Topic 2.** Emerging pollutants in the marine environment: contribution of maritime transport activity.
- **Topic 3.** Environmental risk assessment and sediment quality guidelines.
- **Topic 4.** Climate change and ocean acidification, a Mediterranean focus.
- **Topic 5.** Seafood safety, hazards and risk analysis.
- **Topic 6.** The UN Sustainable Development Goals, focus on SDG 13 (climate) and SDG 14 (Ocean).

Generally speaking, the topics help to achieve the stated objective. In addition, the structure of the sessions allows the content to be learned gradually. In this sense, we start with a general overview of marine pollution and its pollutants, followed by specific cases and examples of marine pollution. The sessions end by addressing the SDGs as a final conclusion and where management efforts in the marine environment need to go.

The topics were developed by professors from the University of Cadiz, Spain (UCA-S) and the University of Cote D'Azur, France (UCA-F); they are researchers and specialists in the areas of

knowledge proposed. Specifically, the University of Cadiz addressed **topics 1, 2 and 3**, while the Cote D'Azur University developed **topics 4, 5 and 6**.

On the other hand, the format of the conference initially planned to be developed in person, during two days at the University of Montenegro. However, due to the restrictions arising from the covid-19 pandemic, it was agreed at the Kick-off meeting that the **sessions related to DEV.3.4.2** would be held in an online format.

The online format made it easier for both teachers and participants to conduct the sessions independently. To **select the dates**, a Doodle was created for each of the proposed sessions in which the participants could show their availability. Based on the results obtained in the Doodles, the dates of the sessions were established (**Table 1**).

In terms of participants, as shown in the project, there should be at least 15 representatives of teaching staff from Montenegrin and Albanian partners. Accordingly, the different dates set in the Agenda were circulated by UCA-S to WP3 contact people for dissemination to interested professors.

Table 1. Calendar for DEV.3.4.2 training sessions

20th December 2021	UCA-S training session	General information and projects about marine pollution and pollutants
10th January 2022	UCA-F training session	Specific pollution and climate change and general information about SDGs
20th January 2022	Last UCA-S training session	Session postponed due to computer problem

1.2. Agenda

In order to facilitate the attendance of the greatest possible number of professors of the universities of Montenegro and Albania, the agenda for this task was organized over two days, concentrating in each one of them the three sessions of professors from the University of Cádiz (UCA-S) and the University University Côte d'Azur (UCA-F) respectively.

As shown in **Table 2**, the three sessions of the UCA-S were initially scheduled to take place on December 20; however, during the event there was a technical problem and the session of the professor Laura Martín (topic 2) could not take place. During the same session, it was proposed to delay it to January 2022, considering the proximity of the Christmas holidays. Finally, it took place on January 20, 2022.



Table 2. Agenda for DEV. 3.4.1 training sessions of University of Cadiz (UCA-S)

Monday 20th December 2021. University of Cadiz (UCA-S)

9:00- 9:15	Entry and welcome Link for the meeting: https://meet.google.com/txu-yntm-cfb
9:15 – 10:00	Milagrosa Oliva, PhD Topic 1: Main pollutants in the marine environment and some tools for their analysis (Part 1)
10:00-10:15	Break
10:15- 11:00	Milagrosa Oliva, PhD Topic 1: Main pollutants in the marine environment and some tools for their analysis (Part 2)
11:00-11:15	Discussion and questions
11:15-11.30	Break
11:30- 12:20	Laura Martín, PhD Topic 2: Emerging pollutants in the marine environment: contribution of maritime transport activity (Part 1)
12:20-12:30	Break
12:30-13:15	Laura Martín, PhD Topic 2: Emerging pollutants in the marine environment: contribution of maritime transport activity (Part 2)
13:15-13:30	Discussion y questions
13:30-14:30	Lunch
14:30-15:20	Miriam Hampel, PhD Topic 3: Environmental risk assessment and sediment quality guidelines (Part 1)
15:20-15:30	Break
15:30-16:30	Miriam Hampel, PhD Topic 3: Environmental risk assessment and sediment quality guidelines (Part 2)
16:30-16:45	Discussion and questions
16:45-17:00	Closing

Monday 10th January 2022. University Côte d’Azur (UCA-F)

9:45- 10:00	Entry and welcome (Christophe Mocquet) Link for the meeting: https://univ-cotedazur.zoom.us/j/85461548737?pwd=QU16MmMrQWFBamJFeDIWZUhoQTRtUT09 Meeting ID: 854 6154 8737 – password: MEP&M
10:00 – 10:50	Steeve Comeau Researcher (CNRS) Topic 1: Climate change and ocean acidification, a Mediterranean focus (Part 1)



- 10:50 – 11:00 Break
- Steeve Comeau**
Researcher (CNRS)
11:00 – 12:00 **Topic 1: Climate change and ocean acidification, a Mediterranean focus (Part 2)**
Discussion and questions
- 12:00 – 13:00 Lunch break
- Marie-Yasmine Dechraoui Bottein**
Full professor (Université Côte d'Azur)
13:00 – 13:50 **Topic 2: Seafood safety, hazards and risk analysis (Part 1)**
- 13:50 – 14:00 Break
- Marie-Yasmine Dechraoui Bottein**
Full professor (Université Côte d'Azur)
14:00 – 15:00 **Topic 2: Seafood safety, hazards and risk analysis (Part 2)**
Discussion & Questions
- Marie-Yasmine Dechraoui Bottein**
Full professor (Université Côte d'Azur)
15:00 – 15:50 **Topic 3: The UN Sustainable Development Goals, focus on SDG 13 (climate) and SDG 14 (Ocean) (Part 1)**
- 15:50 – 16:00 Break
- Marie-Yasmine Dechraoui Bottein**
Full professor (Université Côte d'Azur)
16:00 – 16:50 **Topic 3: The UN Sustainable Development Goals, focus on SDG 13 (climate) and SDG 14 (Ocean) (Part 2)**
Discussion & Questions
- 16:50 - 17:00 Closing

Thursday 20th January 2022. University of Cadiz (UCA-S)

- 9:00- 9:15 **Entry and welcome**
Link for the meeting: <https://meet.google.com/upp-sgki-zcd>
- Dra. Laura Martín, PhD**
9:15 – 10:00 **Topic 2: Emerging pollutants in the marine environment: contribution of maritime transport activity (Part 1)**
- 10:00-10:15 **Break**
- Dra. Laura Martín, PhD**
10:15- 11:00 **Topic 2: Emerging pollutants in the marine environment: contribution of maritime transport activity (Part 2)**
- 11:00-11:30 **Discussion and questions**
- 11:30-12:00 **Closing**



2. Overview of University of Cadiz training sessions

2.1. Topic 1. Main pollutants in the marine environment and some tools for their analysis

Author(s) of topic 1: María de Andrés García and Milagrosa Oliva, University of Cadiz (Spain).

Date: Monday, 20th December 2021.

Organized by: University of Cadiz, Spain.

Professor: Milagrosa Oliva, PhD.

Contents taught:

In this session the professor talked about the pollution related with maritime transport. A complex pollution where an air pollution, acoustic pollution and water pollution are integrated. It's necessary to know de characteristics of pollutant to understand de mechanisms and effects of different pollutions on the aquatic environment. The air pollution produced by de diesel exhausts causes respiratory problems and contributes to the greenhouse effect.

Acoustic pollution produced by the propulsion systems causes serious problem in the behaviour of aquatic mammals and water pollution produced by sewage as waste water, solid waste an oil spills are the main pollution in the aquatic environment with devastating effects. A note about the regulation through different agreements as for example MARPOL agreement is also realised.

On the other hand, toxicity bioassays and pollution biomarkers are described as tools to pollution assessment. Characteristics of bioassays as taxon used, time exposure, life stages of the organisms tested etc. are presented. Different toxicity parameters as LOEC, NOEC, LC50 concentration etc. are used in the ecotoxicological studies. Biomarkers as oxidative stress biomarkers or histopathology are other tools to assessment de effects of pollution on the organisms.

Discussion and questions:

Some general questions were made and one about the importance of this topic. Some professors comment the importance of the technology as a tool to avoid de pollution but not also the regulation. But this is an interesting and wide topic to develop in other moment.



Main conclusion:

The topic was of relevance for the universities involved in the meeting, is multidisciplinary and of interest for future students. The following conclusions stand out:

The pollution produced by maritime transport is very complex and cause effects on the aquatic organisms and on the human health. Specifically: Air pollution contributes to the greenhouse effect and cause respiratory problems in humans; and the acoustic pollution affect to marine mammals; but the worst pollutant from shipping is the wastewater.

Legislation is an important tool to fight against pollution and technology is a tool to remediate pollution effects.

2.2. Topic 2. Emerging pollutants in the marine environment: contribution of maritime transport activity

Author(s) of Topic 2: María de Andrés García and Laura Martin, University of Cadiz (Spain).

Date: Thursday, 20th January 2022.

Organized by: University of Cadiz, Spain.

Professor: Laura Martin, PhD.

Contents taught:

This topic was not developed in the first date (20th December) because Prof. Laura Martin's presentation had technical problems. The participants understood the situation and the Professor's session was postponed to 20th January.

The contents taught in this session were of great interest for the participants. The professor talked about the identification of contaminants of emerging concern. Moreover, was treated an analysis of main sources of contaminants of emerging concern in marine ecosystems.

More information about emerging pollutants were developed, as the characterization of contaminants of emerging concern in effluents from wastewaters.

Moreover, the disposal of wastewater effluents of ship cruises worldwide was taught, specifically, an analysis of present situation and regulatory framework, chemical characterization of contaminants of emerging concern in wastewater effluents.

The professor talked about the environmental risk assessment of contaminants of emerging concern in wastewater effluents, and specifically about waste Effluent Toxicity and Tier approaches.



Discussion and questions:

The training was of great interest to the participants and no question emerged in the session.

Main conclusion:

Wastewater effluents from cruise ships constitute a significant risk to marine ecosystems, both in deep waters and in the open sea.

Cruise ship wastewater effluents are not subject to mandatory treatment before discharge to the sea.

The contribution of contaminants of emerging concern to the sea from cruise ships is in the same order of magnitude as the contribution of wastewater effluent from land-based treatment plants.

It is necessary to evaluate the environmental risk of cruise ship wastewater effluents, especially "grey water" and "black water", in order to propose quality guidelines for their monitoring and to allow the maintenance of a correct state of health of the ecosystems.

2.3. Topic 3. Environmental risk assessment and sediment quality guidelines

Author(s) of Topic 3: María de Andrés García and Miriam Hampel, University of Cadiz (Spain).

Date: Monday, 20th December 2021.

Organized by: University of Cadiz, Spain.

Professor: Miriam Hampel, PhD.

Contents taught:

The topic of this talk was the introduction to the environmental risk evaluation process of contaminants. This included the main pathways of contaminant generation and release as well as explanation of the main environmental regulations. The environmental risk assessment was explained for the aquatic and sediment compartments, with the main focus on the generation of toxicity parameters and the derivation of predicted no effect concentrations for their posterior employment in the risk assessment. Examples of exercises from previous years under different master programs were presented, and practical sessions outlined.

In part 1 the following topics were discussed: the current situation of environmental contamination, existing environmental legislations, basic principles of toxicity testing and



examples of toxicity tests under the OECD testing guidelines, derivation of predicted no effect concentrations and environmental risk quotient interpretation for the aquatic environment.

In part 2 (after a 5-minute break) the following topics were discussed: The subject was expanded to the sediment compartment and the increased difficulty due to the higher complexity of these systems.

Discussion and questions:

No questions were asked at this point, but postponed to the definitive creation of the teaching material for the Development of Regional Joint Master Program in Maritime Environmental Protection and Management.

Main conclusion:

The main conclusion of this session was the need of the development of alternative environmental risk assessment strategies to overcome the problems related to individual compound toxicity testing as carried out traditionally due to the huge amount of existing and new contaminants of emerging concern.



3. Overview of University of Cote D'Azur training sessions

3.1. Topic 4. Climate change and ocean acidification, a Mediterranean focus

Author(s) of Topic 4: Steeve Comeau, University Côte d'Azur

Date: 10th January 2022

Organized by University Côte d'Azur

Content taught:

This session covers the state of knowledge on CO₂ emissions, the link with climate change, the different scenarios for the future recently updated by the IPCC, the effect of CO₂ on ocean acidification, why calcifying organisms are sensitive to this acidification and what are the expected effects of climate change on marine organisms, with a focus on the Mediterranean.

Discussion and questions:

The audience was updated on the latest developments in the fields of the effect of climate change.

Main conclusion:

In conclusion, the main concepts developed were: CO₂ emissions and climate change, ocean acidification, organism sensitive to ocean acidification and effects of climate change on marine organisms.

3.2. Topic 5. Seafood safety, hazards and risk analysis

Author(s) of Topic 5: Marie-Yasmine Dechraoui Bottein, University Côte d'Azur.

Date: 10th January 2022.

Organized by: University Côte d'Azur.

Content taught:

This session on Food safety offers an introduction to fish and fishery product hazards and risk analysis. Topics include key contaminants and Risk analysis. Participants learn about the main seafood hazards including chemical contaminants, biotoxins, veterinary drugs and microbiological and biological contamination. As well, they are introduced to the structure



of risk analysis that makes up the foundation of sound food safety practices, decisions and policies.

Discussion and questions:

A few questions were asked, especially on the way to monitor seafood pollution. The speakers started a discussion that continued via 1:1 discussion after.

Main conclusion:

As general conclusion, the main seafood included in studies and which are threatened are finfish, crustaceans, cephalopods, echinoderms, bivalve molluscs and gastropods mollusc.

3.3. Topic 6. The UN Sustainable Development Goals, focus on SDG 13 (climate) and SDG 14 (Ocean)

Author(s) of Topic 6: Marie-Yasmine Dechraoui Bottein, University Côte d'Azur.

Date: 10th January 2022.

Organized by: University Côte d'Azur.

Content taught:

This session provides an overview of the concept of the Sustainable Development Goals and their targets with a particular focus on the SDG 13 on Climate Action to Take urgent action to combat climate change and its impacts and the SDG14 14 on life below water to Conserve and sustainably use the oceans, seas, and marine resources. Participants enhance their knowledge on why the goals are important and how to contribute to their achievement, though, for example, the development of higher education curricula.

Discussion and questions:

No question was developed.

Main conclusion:

By concluding the DEV.3.4.2, this training session was brought to a close with a review of the SDGs, especially SDG 14, the most relevant for the participants in this training.



4. General conclusions

The activities developed within the framework of DEV.3.4.2. have allowed the achievement of the general objective and, therefore, have enabled the teaching staff of the universities in the project to increase their knowledge on topics about marine pollutants, effects on climate change and Sustainable Development Goals.

On the one hand, the contents taught have made it possible to see the effects of climate change in relation to marine pollution. From a general to a more specific perspective. In addition, a further step has been taken towards the current management models aimed at achieving the Sustainable Development Goals.

On the other hand, from the point of view of participation, there has been a higher attendance than in the first training (DEV.3.4.1), this may be due to the fact that the sessions are already known and arouse the interest of more participants.