Coordinator

Universitat de Girona

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Partners

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MEDITERRANEAN ENVIRONMENTAL CHANGE MANAGEMENT
MASTER STUDY & ECOSYSTEM BUILDING

PROPOSED CURRICULUM

MASTER'S IN MEDITERRANEAN ENVIRONMENTAL CHANGE MANAGEMENT

The Master's is intended for university graduates who wish to specialize in the professional analysis and management of environmental problems, in private industry or public institutions and non-governmental organizations

The master's programme will focus on the environmental problems specific to the Mediterranean basin and that are largely common to all the countries and partners participating in the MEHMED project. It is important to note that the Mediterranean region is considered one of the regions that is and will be most affected by the impact of the so-called global environmental change that has especially relevant repercussions in this region due to its socio-environmental characteristics.

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OBJECTIVES

General

✓ To train good professionals to conceive of and enable a more sustainable and especially efficient model to address socio-economic and socio-environmental issues**.**

✓ To provide training in different scientific approaches to the study of environmental change.

✓ To apply them to the management of specific environmental changes at local and regional scales.

✓ To identify adaptation processes and instruments for sustainable management based on the evaluation of adaptive strategies.

Specific

✓ To acquire basic knowledge to analyse, diagnose and manage global environmental change.

✓ To acquire basic knowledge to manage the reduction of impacts on society and the environment and facilitate social and environmental adaptations.

✓ To acquire the expertise, skills and tools needed to solve the previously mentioned problems.

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COMPETENCIES: STRUCTURAL ELEMENTS OF THE MASTER'S

Following the European model of master's programmes established in the Bologna Plan (1999), we intend to design and implement the master's programme based on the achievement of competencies and learning outcomes.

The concept of 'competencies' is defined as 'the sets of knowledge, skills and attitudes that allow the successful execution of tasks with emphasis on solving the problems of the real world, facing challenges and seizing opportunities.

Competencies are combinations of acquired knowledge, skills and attitudes. They are developed from comprehensive learning experiences in which knowledge and skills interact to respond efficiently to the task at hand.

They involve the active and comprehensive use of knowledge, skills and attitudes. By their very nature, they can only be achieved in the final stages of the educational process (practical sessions, internships, master's theses or projects, etc.).

To sum up:

✓ ***Competencies are the combination of skills, attitudes and knowledge required to carry out a task effectively.***

✓ ***Competencies are demonstrated through action and, therefore, they are only assessable as long as the activities imply their use.***

Basic competencies
Students should know how to:

CB1-Work in teams, especially at the multidisciplinary level, trying to incorporate contributions that result from shared reflection.

CB2-Locate and select sources and information using specialized information and communication technologies to develop original research whose ideas are incorporated in a critical and creative way.

CB3-Commuicate orally and in writing their conclusions and the knowledge and underlying reasons that sustain them to both specialized and non-specialized audiences in a clear and unambiguous way.

CB4-Analyse new and complex situations and design various alternative strategies to resolve them.

CB5-Possess the learning skills that allow them to continue studying in a largely self-directed or autonomous way.

CB6-Integrate knowledge and understand the complexity of masking judgements based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities.

CB7-Work autonomously, balancing and making the most of personal potential to improve professionally and as a researcher.

General competencies
Students should know how to:

CG1-Apply the concept of complexity to the analysis and the interpretation of environmental processes and changes.

CG2-Analyse and interpret the processes of change and environmental conflicts drawing from conceptual frameworks in various disciplines.

CG3-Analyse and interpret the response and management mechanisms of environmental processes and changes.

CG4-Apply sustainable planning instruments and techniques to build environmental scenarios and policies aimed at protecting, improving and recovering the territory and the environmental vectors.

CG5-Apply circular and collaborative green economy instruments and techniques at the local and regional level to promote new strategies and innovations.

CG6- Rank, based on the concept of scale, the factors that affect case studies, from the local to the international level.

CG7-Apply acquired knowledge and problem-solving ability in new or unfamiliar environments within broader contexts (or multidisciplinary ones) related to your area of study.

CG8-Apply and interpret statistical methods and data and use geographic information systems in territorial planning and in the conservation of biodiversity.

Specific competencies

Students will master a set of specific competencies. First, it would be desirable for the universities of the different countries to agree on 2 or 3 specific competencies (SC) linked to the information collected about training needs and career opportunities. To define them, it would be appropriate and advisable to use the report as a point of reference: Summary of responses to questionnaires on relevant topics related to environmental change, ability to generate employment and prioritization of competencies.

SC1 – ¿??????????????

SC2 – ¿??????????????

SC3 – ¿??????????????

Second, in addition to SC linked to training needs related to the job market, another 2 or 3 specific competencies are proposed by each university in line with its profile and specialization detailed in the so-called Optional Module. Once again, the reports on the master's programmes offered by the partner universities within the framework of the MEHMED project can serve as an environmentally themed guide.

SC4 – ¿??????????????

SC5 –

SC&

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NUMBER OF STUDENTS REGISTERED IN THE MASTER'S PROGRAMME

The number of students registered each year in the Master's programme should be around 25: between a minimum of 20 and a maximum of 30.

ORIGIN OF THE STUDENTS

In accordance with its specializations, each university must define the possible origins of students always keeping in mind that multidisciplinarity has transcendental value to address the complexity inherent in the processes of environmental change. Therefore, consideration should be given to a broad profile of potential candidates such as environmentalists, geographers, agronomists, biologists, chemists, architects-town planners, physicists, etc.

STRUCTURE OF THE MASTER'S

The design of the Master's programme should be based on a curriculum with a professional profile. That means preparing students to enter the job market and, ultimately, to train a good professionals capable of working in a cross-disciplinary and interdisciplinary way in private enterprise as well as in public administration, non-governmental organizations or in research and/or training centres.

The Master's programme will be designed so that students can complete it, full time, over 12 months (4 semesters). It will consist of 120 ECTS credits. If students are also working, they can complete the master's degree over a longer period in accordance with the regulations of each university.

Value of the credit
120 ECTS credits
Equivalence of ECTS credits in terms of workload: 1 credit = 25 hours of student work of which between 8 and 10 hours are spent in face-to-face classes.

It is important that the subjects be programmed by semesters. If possible, it is recommended that each subject is consolidated not taught in a too long or drawn out way. This facilitates the interaction between theory and practice, group work and the application of new methods. For example, a subject of 3 ECTS credits, which means 30 hours of face-to-face class time, could be taught for 2 hours a day for 3 weeks. In 3 weeks, students would be able to complete 2 subjects of 3 ECTS credits each.

The 120 ECTS credits are organized in modules, which are then divided into subjects.

MODULES	ECTS credits
COMPULSORY MODULE	36
OPTIONAL MODULE	45
FREE ELECTION	9
PRACTICAL MODULE	12
MASTER'S DEGREE FINAL THESIS/PROJECT	18

Compulsory Module: Required at all universities where the master's is taught. It should be approached from different disciplines to holistically treat environmental issues.

Optional module: Designed according to the specialization of each university where the master's is taught as well as to the results of the report on market needs.

Practical modules*:* Work in a private company, in public administration, non-governmental organizations or research centres.

Master's degree final thesis/project: Individual work linked to the practical module or developed within the framework and under the supervision of a university research group.

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TEACHING PLAN

COMPULSORY MODULE **(Draft proposal based on the UdG's experience)**	**ECTS CREDITS** **33**	**YEARS**
✓ Scientific foundations for environmental change ✓ Interaction between environmental change and human activity ✓ Interaction between environmental change and the natural environment	6 6 6	1 1 1
✓ 1- Workshop ✓ 2- Workshop	3 3	1 2
✓ Introduction to GIS ✓ GIS and environmental (impact) assessment	3 3	1 1
✓ 1- Introduction to multivariable analysis (I) ✓ 2- Introduction to multivariable analysis (II)	3 3	1 2
OPTIONAL MODULE **Examples of UdG master's** **(to be defined by each partner university)** ✓ Biodiversity management ✓ Pollution and energy management ✓ Land management and planning ✓ Environmental education ✓ Etc.	**ECTS CREDITS** **48** 3 3 3	1 and 2

FREE ELECTION	**CREDITS 12**	
✓ Free election	9	1 and 2
✓ English	3	1 and 2
PRACTICAL MODULE	**CREDITS 15**	**2**
MASTER'S DEGREE FINAL THESIS/PROJECT	**CREDITS 18**	
✓ Research bases ✓ Project	3 15	2 2
✓ Final thesis/project	15	2

POSSIBLE DESCRIPTORS OF THE COMPULSORY SUBJECTS AND MODULES

As a starting point and practical example for discussion, a first proposal of the possible descriptors and their connection with basic and general competencies from the experience of the University of Girona's Master's in Environmental Change are also provided.

Scientific basis of environmental change – The subject begins with a discussion about planetary limits and growth, which justify the remaining content. Climate change is addressed starting from a description of the climate system that contemplates the elements that constitute it and the factors that make it up, including feedback, the energy balance, the greenhouse effect and ocean currents. Next comes the treatment of spatial and temporal variability, climate scales and extreme episodes, and the causes and evidence of climate change. Attention is also paid to climate modelling, simulation regionalization, and future scenarios and projections. Finally, some effects on the natural environment in the Mediterranean context are dealt with, such as water resources, land degradation and desertification; and other issues related to environmental change, such as the hole in the ozone layer and electromagnetic pollution.

Competencies *CB2, CG1, CG2, CG6*

Interaction between environmental change and human activity - The subject begins with the foundations of a sustainability strategy and of sustainable development goals (SDG). Next, and as the central axis of the module, we will analyse the current situation, the impacts, the short-term adaptations and the reorientation of strategies and policies by different economic sectors: agriculture, industry and tourism. In a third phase, we will repeat these analyses throughout cities, territories and landscapes.

Competencies *CB2, CB3, CG1, CG2, CG5, CG6*

Interaction between environmental change and the natural environment - The subject starts from the concept of disturbance and change in the regime of disturbances associated with global environmental change. Next, we analyse biological invasions, forest fires, habitat destruction, the effects of climate change on the distribution of species, changes in the carbon balance of ecosystems, the prevention and management of environmental changes. Finally, restoration of disturbed ecosystems will be discussed.

Competencies *CB1, CB3, CG1, CG2, CG6*

Workshop- From the approach to a real environmental problem and to the formulation of a series of issues that interrelate social issues, the natural environment and environmental vectors, the students should delve deeper into the processes and impacts contribute to the complexity of the environmental change studied. It is important that they be carried out far from classrooms.

Competencies *CB1, CB2, CB4, CB6, CG3, CG6, CG7*

Introduction to GIS - Study of the basic applications of geographic information systems. We will work on the data acquisition processes (sources, standards and interoperability among formats), the techniques to create, manipulate and present geographic information (graphic and alphanumeric) and the main geoprocessing tools of the vector model for the spatial analysis of environmental problems and

territorial planning. (According to the origin of the students, the credits of this subject that may be transferrable.)

Competencies *CB2, CG1, CG6, CG7*

GIS and environmental (impact) assessment - This subject focuses on spatial analysis techniques of raster and vector models: from the design and creation of databases to the resolution of environmental problems using multicriteria, three-dimensional, geostatistical analyses of networks and models. Scientists and managers of the territory use GIS to study the state of the environment, prepare reports on environmental phenomena, and model how the environment responds to natural factors and to those of human origin.

Competencies *CB1, CB2, CB4, CG1, CG6, CG7*

Introduction to multivariable analysis - Fundamentals and application of linear models. Non-linear relationships and transformations. Generalized linear models and logistic regression. Sorting and classification methods: principal component analysis and of simple and multiple correspondence analysis. Cluster analysis: hierarchical methods and partitions. Introduction to R software.

Competencies *CB2, CG1, CG6, CG7*

Master's degree final thesis/project –

The master's degree final thesis/project consists of two parts.

In the first part, the students will take a seminar in which they will be given the foundations to carry out good scientific research: determining objectives, formulating hypotheses, structuring research, quantitative and qualitative methodologies, citations, bibliography, etc.

The second part consists of students individually completing a project, a study or a report that reflects the concepts and skills acquired during the Master's programme. The work will be based on an experimental/empirical analysis and will require building scenarios, designing strategies and applying tools and techniques for a more sustainable management of environmental vectors, of the natural environment and of the territory. Preferably the work should be linked to a line of research (of the research groups related to the master's) or to a public or private administration or company, or a non-

governmental organization that investigates or works on planning and management projects related to environmental change. A collaboration agreement will be signed between the university and the company.

Competencies *CB2,CB3,CB4,CB5,CB6,CB7,CG1,CG2,CG3,CG4,CG5,CG6,CG7*

POSSIBLE TEACHING METHODOLOGIES

- ✓ Lectures
- ✓ Participatory classes
- ✓ Resolution of exercises and problems
- ✓ Problem-based learning
- ✓ Project-based learning
- ✓ Cooperative learning

NOTE: When analysing and designing the subjects, it is important to keep in mind that this is an interdisciplinary master's programme in which students with different levels of knowledge will enrol.