# A1: Interdisciplinary Concepts of Environmental, Economic and Social Sustainability: Theory and Practice of Interdisciplinarity

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| **Number of ECTS credits** | 3 |
| **Typology** | *OB* |
| **Temporary organization** | *1.1* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • Introduction to the history and theory of interdisciplinarity/transdisciplinarity in environmental, economic and social sustainability research.<br>• The different approaches to co-production in research in the field of environmental, economic and social sustainability.<br>• Review and preparation of practical co-production experiences. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA01: Describe the complexity of the interdisciplinary perspective in sustainability, by analysing its need and the existing barriers to its practice, differentiating between interdisciplinary and transdisciplinary approaches. (KT01)*<br>*KA02: Define the different approaches to co-production in environmental studies by integrating the values, assumptions, methodologies and practices of the academic and non-academic groups involved. (KT01)* |
| | **Skills:**<br>*SA01: Apply principles of systems thinking to analyse the interaction between environmental, social and economic subsystems, critically assessing the different existing assumptions. (ST01)*<br>*SA02: Independently select relevant scientific and technical information for the contextualization and substantiation of interdisciplinary projects. (ST03)*<br>*SA03: Apply co-production tools in interdisciplinary or transdisciplinary contexts, determining possible strategies based on the collective definition of the challenges to be addressed. (ST06)* |
| | **Competencies:**<br>*CA01: Analyse complex socio-environmental problems to support critical judgments on sustainability, understanding and contextualising the plurality of existing perspectives. (CT01)*<br>*CA02: Critically evaluate the conclusions of interdisciplinary analyses in environmental studies. (CT06)*<br>*CA03: Demonstrate ethical responsibility and respect for diversity in interdisciplinary contexts by applying the concepts and theories of co-production in environmental, economic and social sustainability. (CT08)* |

| **Training Activities** | | Directed | Supervised | Autonomous |
|---|---|---|---|---|
| | Hours | 18 | 10 | 47 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A2: Interdisciplinary Concepts of Environmental, Economic and Social Sustainability: Interdisciplinary Project

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|---|---|
| **Number of ECTS credits** | 9 |
| **Typology** | *OB* |
| **Temporary organization** | *1.Annual* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | Methodological:<br>• Design and execution of a project applied in interdisciplinary teams.<br>• Application of analysis methodologies and proposals for intervention in the territory.<br>• Development of use cases based on real territorial challenges, and an interdisciplinary approach, integrating the key concepts of the three specialities of the master's degree.<br>Advanced:<br>• Main concepts related to industrial ecology to evaluate anthropogenic systems and minimize their negative effect on the planet.<br>• Interdisciplinary approach to the subsystems that make up Earth systems, with special attention to the detailed analysis of the dynamic interactions between their climatic, biological and anthropic components at multiple temporal and spatial scales. The importance of valuing Earth systems by studying vegetation and land-use changes is highlighted, offering a comprehensive understanding of the dynamics that drive global processes.<br>• Environmental policy instruments. Main concepts developed by the theory of ecological economics and political ecology to diagnose sustainability problems from an interdisciplinary and critical point of view. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA03: Relate the application of the principles of industrial ecology with waste management in the design of interdisciplinary sustainability projects. (KT02, KT03)*<br>*KA04: Explain the dimensions of global change and its impacts on the approach to problems and solutions in sustainability projects in various ecosystems and natural spaces. (KT04, KT05)*<br>*KA05: Describe how the frameworks of ecological economics and political ecology determine the analysis and proposal of interventions in interdisciplinary projects. (KT06, KT07)* |
| | **Skills:**<br>*SA04: Develop diagnostic and planning methodologies for the conceptualisation and design of interdisciplinary projects in the field of environmental, economic and social sustainability. (ST01)*<br>*SA05: Apply tools and methodologies, such as spatial and statistical analysis, in the execution of an interdisciplinary project based on a real territorial challenge of sustainability. (ST02)*<br>*SA06: Select the relevant actors for the execution of interdisciplinary projects in sustainability. (ST07)* |
| | **Competencies:**<br>*CA04: Work collaboratively in multidisciplinary and international teams to address complex sustainability challenges, integrating the ethical, social and gender perspective. (CT04)*<br>*CA05: Communicate the results of sustainability projects, adapting the message to different audiences. (CT05)* |

| **Training Activities** | | Directed | Supervised | Autonomous |
|---|---|---|---|---|
| | Hours | 54 | 40 | 131 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A3: Interdisciplinary Concepts of Environmental, Economic and Social Sustainability: Communication and Scientific Dissemination

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|---|---|
| **Number of ECTS credits** | 3 |
| **Typology** | *OB* |
| **Temporary organization** | *1.2* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | Methodological:<br>Scientific communication and dissemination of science.<br><br>Advanced:<br>The sessions include general training activities on concepts and resources for scientific communication and dissemination, as well as more specific activities that can be applied later, on the one hand, in the interdisciplinary project in teams of several students and, on the other hand, in the individual TFM project.<br>The type of training activities include readings, short writing and design for communication and scientific dissemination, academic debates and oral presentations with the support of PPT and other media. Students will be encouraged to link their oral presentations with the Sustainable Development Goals (SDGs) of the UN's 2030 Agenda or with other ways of promoting sustainability. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA06: Define the theories, concepts and resources of scientific communication and the dissemination of science in environmental studies. (KT08)*<br>*KA07: Define ethical principles in the communication and dissemination of scientific information. (KT08)* |
| | **Skills:**<br>*SA07: Prepare clear and precise scientific texts in the field of environmental studies, adapted to different formats and purposes of academic publication. (ST04)*<br>*SA08: Design effective oral presentations on sustainability issues by making the presentation for specialized academic audiences. (ST04)*<br>*SA09: Use digital tools and platforms for the dissemination and exchange of scientific knowledge. (ST04)*<br>*SA10: To autonomously use resources and methodologies for scientific communication and dissemination in the field of sustainability. (ST05)* |
| | **Competencies:**<br>*CA06: Effectively communicate research results and environmental management strategies to specialized and non-specialized audiences by adopting a critical and inclusive approach. (CT05)*<br>*CA07: Demonstrate ethical responsibility in scientific communication and dissemination on environmental, economic and social sustainability. (CT08)* |

| **Training Activities** | | Directed | Supervised | Autonomous |
|---|---|---|---|---|
| | Hours | 18 | 10 | 47 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A4: Industrial Ecology

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|---|---|
| **Number of ECTS credits** | 9 |
| **Typology** | *OP (Compulsory Specialty)* |
| **Temporary organization** | *1.1* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • Concepts of Industrial Ecology as an area of multidisciplinary research. Some of these concepts are: systems theory, resource consumption and socioeconomic metabolism.<br>• Methodology of Material Flow Analysis (MFA) and its application to different systems such as at the product, process, or region level, from urban to industrial systems.<br>• Life Cycle Assessment (LCA) methodology for products and processes for the assessment of environmental impacts and the analysis of improvements. Concepts of attributional and consequential LCA, scenario and sensitivity analysis, and application of programs and databases to case studies.<br>• Application of thermodynamics to different systems, such as the concept of exergy to determine the efficiency of the system. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA08: Describe the fundamental concepts of industrial ecology and their application to the study of productive and urban systems. (KT01)*<br>*KA09: Define the principles, tools and methodologies of Life Cycle Assessment (LCA) and its application in the environmental assessment of products and processes. (KT02)*<br>*KA10: Explain the methodology of Material Flow Analysis (MFA) and its application at different scales. (KT02)* |
| | **Skills:**<br>*SA11: Manage Life Cycle Analysis (LCA) and Material Flow Analysis (MFA) software to quantify the environmental impacts of products and processes. (ST02)*<br>*SA12: Analyse production systems in the context of industrial ecology, selecting the most appropriate methodologies for this purpose. (ST08)* |
| | **Competencies:**<br>*CA08: Design innovative strategies and proposals in industrial ecology to solve current environmental challenges. (CT02)*<br>*CA09: Develop sustainable management solutions in production systems, applying Life Cycle Assessment (LCA) for the assessment of environmental impacts. (CT03)*<br>*CA10: Demonstrate ethical responsibility in the design and implementation of industrial ecology solutions. (CT08)* |

| **Training Activities** | | Directed | Supervised | Autonomous |
|---|---|---|---|---|
| | Hours | 54 | 35 | 136 |
| | % face-to-face attendance | 100% | 10% | 0% |

| A5: Waste Management | |
|---|---|
| **Number of ECTS credits** | 6 |
| **Typology** | *OP (Compulsory Specialty)* |
| **Temporary organization** | *1.1* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | Block 1. Linear economy. Context of the economic model and its externalities. Origin and typology of urban and industrial waste and current management systems.<br>• Waste in the linear economy: characteristics and potential impacts<br>• Classification systems for different types of urban and industrial waste according to European framework regulations.<br>• Urban solid waste collection systems and their transport: typologies, characteristics, advantages and disadvantages<br>• For the following treatment systems, analysis of: Origin and inflow and outflow of materials and waste, types of treatment systems and characteristics and potential applications of the resulting materials<br>  ○ Landfills. Includes estimation of its emissions (modelling with Landgem among others)<br>  ○ Incineration (energy recovery)<br>Block 2. Sustainable management of materials at urban and industrial level. Circular economy. Characteristics of circular models and their potential for impact on externalities.<br>• Waste in the recycling economy and in the circular economy. Quantitative, economic and environmental impacts.<br>• Product design and business model characteristics relevant to the minimization of waste and generation of valuable secondary materials.<br>• For the following treatment systems, analysis of: Origin and inflow and outflow of materials, types of treatment systems and characteristics and potential applications of the resulting materials<br>  ○ Wastewater Treatment<br>  ○ Anaerobic digestion<br>  ○ Composting<br>  ○ Plants for the selection and recycling of containers and packaging, glass and other types of inorganic materials (e.g. construction waste).<br>• Visit (potentially virtual) to the Composting and Anaerobic Digestion Plant<br>• Inorganic Materials Recycling Case Study Seminar (Potentially Virtual) for a Next High-Value Application<br>• References and tools in relation to ecodesign, industrial ecology or biomimetics and impact measurement |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA11: Explain the origin, typology and flows of waste, as well as the basic operations for its management and use within the framework of the linear economy. (KT03)*<br>*KA12: Describe the principles of the circular economy and distinguish its models and the potential for impact on the sustainable management of urban, agricultural and industrial materials. (KT03)*<br>*KA13: Define the characteristics and emissions associated with waste treatment systems, both in the framework of the linear economy (landfills, incineration) and circular economy (wastewater treatment, anaerobic digestion, composting). (KT03)* |
| | **Skills:**<br>*SA13: Evaluate the possibilities of reducing environmental impacts and greenhouse gases (GHG) through the application of new technologies, methodologies and systems for waste management and use. (ST01)*<br>*SA14: Select the relevant actors in the waste management value chain for the design of circular economy strategies. (ST07)* |
| | **Competencies:**<br>*CA11: Develop sustainable management solutions in the waste sector, applying environmental assessment tools. (CT03)* |

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| | *CA12: Work in interdisciplinary and international teams to address complex challenges in sustainable materials and waste management. (CT04)*<br>*CA13: Propose measures to reduce economic, territorial and gender inequalities associated with waste management. (CT07)* | | | |
| **Training Activities** | | Directed | Supervised | Autonomous |
| | Hours | 36 | 20 | 94 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A6: Global Change

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|---|---|
| **Number of ECTS credits** | 9 |
| **Typology** | *OP (Compulsory Specialty)* |
| **Temporary organization** | *1.1* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • *Drivers* and types of impacts related to global change at various temporal and spatial scales.<br>• Exploration of impacts at different spatial and temporal scales in both terrestrial and marine ecosystems.<br>• Study of the interaction with other forces of change such as climate change.<br>• Analysis based on examples related to land use, biodiversity conservation, or the global carbon and water cycle. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA14: Describe the drivers and types of impacts of global change at various temporal and spatial scales on terrestrial and marine ecosystems. (KT04)*<br>*KA15: Relate the interaction between global change and climate change as interconnected forces of change. (KT01)*<br>*KA16: Illustrate the manifestations of global change through examples related to land use, biodiversity conservation, and global carbon and water cycles. (KT04)* |
| | **Skills:**<br>*SA15: Apply methodologies for the exploration and analysis of the impacts of global change on terrestrial and marine ecosystems. (ST01)*<br>*SA16: Manage specialized programs for the management and analysis of information on global change to inform the understanding and analysis of its impacts. (ST02)*<br>*SA17: Analyse the functioning of the planet in order to interpret environmental changes according to different spatial and temporal scales. (ST08)* |
| | **Competencies:**<br>*CA14: Develop sustainable management solutions, based on the assessment of environmental impacts by applying climate scenarios. (CT03)*<br>*CA15: Communicate findings on the impacts of global change clearly and unambiguously to specialist and non-specialist audiences, both orally and in writing. (CT05)* |

| **Training Activities** | | Directed | Supervised | Autonomous |
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| | Hours | 54 | 35 | 136 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A7: Analysis and Management of Natural Landscapes

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| **Number of ECTS credits** | 6 | | | |
| **Typology** | *OP (Compulsory Specialty)* | | | |
| **Temporary organization** | *1.1* | | | |
| **Language** | *English* | | | |
| **Modality** | *Face-to-face* | | | |
| **Contents of the subject** | • Analysis of different types of natural spaces in marine and terrestrial environments.<br>• Identification of the factors and effects of global change on natural spaces.<br>• Design of evaluation and management strategies in marine and terrestrial environments through a holistic and global vision, taking into account their ecological, social and economic factors. | | | |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA17: Describe the different types of natural spaces (marine and/or terrestrial) in relation to their ecological, social and economic characteristics. (KT05)*<br>*KA18: Define the factors and effects of global change on natural spaces considering their ecological, social and economic dimensions. (KT04)*<br>*KA19: Appropriately select management tools for the protection of natural spaces, considering their application in various territorial and socio-environmental contexts. (KT01)* | | | |
| | **Skills:**<br>*SA18: Independently select relevant scientific information on natural areas for decision-making in their management. (ST03)*<br>*SA19: Select the key actors in the management and conservation of natural spaces. (ST07)* | | | |
| | **Competencies:**<br>*CA16: Design innovative strategies and proposals for the sustainable management of natural spaces. (CT02)*<br>*CA17: Work effectively in a multidisciplinary context in natural space management projects. (CT04)*<br>*CA18: Propose sustainable management measures that promote territorial equity and reduce barriers to access to natural spaces. (CT07)* | | | |
| **Training Activities** | | Directed | Supervised | Autonomous |
| | Hours | 36 | 23 | 91 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A8: Foundations of Ecological Economics

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|---|---|
| **Number of ECTS credits** | 9 |
| **Typology** | *OP (Compulsory Specialty)* |
| **Temporary organization** | *1.1* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • Origin and principles of ecological economics.<br>• Complexity and exosomatic evolution.<br>• Well-being and externalities.<br>• Environmental policy instruments in the management of energy, natural resources and emissions.<br>• Ecological footprint and rebound effects on energy and water.<br>• Socioeconomic metabolism.<br>• Limited rationality, social interactions, and environmental governance institutions.<br>• Environmental Services - assessment and policy options.<br>• Multi-criteria analysis for decision-making.<br>• Debates on growth and the environment. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA20: Define the origins, principles and key concepts of ecological economics, such as complexity, exosomatic evolution, well-being and externalities, and environmental policy instruments. (KT06)*<br>*KA21: Describe the integration between economics and biophysical systems, including concepts such as ecological footprint, rebound effects, socioeconomic metabolism, environmental services, and institutions. (KT01, KT06)*<br>*KA22: Define ~~the main debates around economic growth and~~ global change from the perspective of green economics. (KT04)* |
| | **Skills:**<br>*SA20: Apply Multicriteria Analysis and computer applications for decision-making in complex environmental problems. (ST02)*<br>*SA21: Analyse the behaviour of relevant economic agents in environmental problems from the perspective of ecological economics. (ST07~~)~~* |
| | **Competencies:**<br>*CA19: Evaluate, from the perspective of ecological economics, the environmental impacts and possible sustainable management solutions through environmental assessment. (CT03)*<br>*CA20: Critically evaluate the ethical and social implications of economic decisions in the field of environmental economics. (CT06)*<br>*CA21: Demonstrate ethical responsibility in the analysis and proposal of solutions from ecological economics for socio-environmental management that respects biological and cultural diversity. (CT08)* |

| **Training Activities** | | Directed | Supervised | Autonomous |
|---|---|---|---|---|
| | Hours | 54 | 35 | 136 |
| | % face-to-face attendance | 100% | 10% | 0% |

| A9: Political Ecology | | | | |
|---|---|---|---|---|
| **Number of ECTS credits** | 6 | | | |
| **Typology** | *OP (Compulsory Specialty)* | | | |
| **Temporary organization** | *1.1* | | | |
| **Language** | *English* | | | |
| **Modality** | *Face-to-face* | | | |
| **Contents of the subject** | • Political ecology as a multidisciplinary approach to the study of environmental problems from a critical perspective.<br>• Major social theories that inform political ecology, including, for example, unequal ecological distribution, commons, social construction of nature, or environmental and climate justice.<br>• Methodological tools for conducting political ecological research.<br>• Selection of key concepts and debates in political ecology relevant to the Global South and North.<br>• Examples of empirical research on the access, use, planning and/or governance of natural resources and urban infrastructure, and the unequal distribution of environmental costs and benefits. | | | |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA23: Define the main social theories that underpin political ecology, such as unequal ecological distribution, the commons, the social construction of nature, and environmental and climate justice. (KT07)*<br>*KA24: Explain key concepts and debates in political ecology, highlighting their relevance in the contexts of the Global South and the Global North. (KT07)* | | | |
| | **Skills:**<br>*SA22: Analyse examples of empirical research on access, use, planning and governance of natural resources and urban infrastructure, and the unequal distribution of environmental costs and benefits. (ST01)*<br>*SA23: To analyse the relevant social and political actors in the study of socio-environmental conflicts from the perspective of political ecology. (ST07)*<br>*SA24: Critically select qualitative and participatory methodologies suitable for research in political ecology. (ST08)* | | | |
| | **Competencies:**<br>*CA22: Design environmental governance strategies and participation of social and institutional actors that promote equitable solutions to socio-environmental conflicts and sustainable resource management. (CT02)*<br>*CA23: Work effectively in a multidisciplinary context to address sustainability challenges from a political ecology perspective. (CT04)*<br>*CA24: Propose measures to reduce socio-environmental inequalities with special attention to the gender perspective and promote environmental justice within the framework of political ecology. (CT07)* | | | |
| **Training Activities** | | Directed | Supervised | Autonomous |
| | Hours | 36 | 23 | 91 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A10: Geographical Information Systems

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|---|---|
| **Number of ECTS credits** | 5 |
| **Typology** | *OP* |
| **Temporary organization** | *1.1* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • Conceptual and methodological foundations of GIS.<br>• The bases of GIS: data models and spatial databases.<br>• Main GIS analysis tools.<br>• Advanced online mapping search. Web geoservices.<br>• Editing the results. Cartographic compositions. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA25: Describe the conceptual and methodological foundations of Geographic Information Systems (GIS). (KT01)*<br>*KA26: Define the data models and spatial databases that form the basis of GIS. (KT01)*<br>*KA27: Explain the main analysis tools available in GIS software, to analyze environmental changes at different scales. (KT05)* |
| | **Skills:**<br>*SA25: Manage GIS software for advanced online mapping search and the use of web geoservices. (ST02)*<br>*SA26: Prepare cartographic compositions and edit results obtained in GIS for the expression of territorial information. (ST04)*<br>*SA27: Autonomously use new GIS software functionalities, evidencing an adequate update through the development of cartographic products. (ST05)* |
| | **Competencies:**<br>*CA25: Analyze complex socio-environmental problems using Geographic Information Systems as a support tool. (CT01)*<br>*CA26: Critically evaluate the ethical and social implications derived from the use of GIS and spatial data in territorial management. (CT06)* |

| **Training Activities** | | Directed | Supervised | Autonomous |
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| | Hours | 30 | 15 | 80 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A11: Qualitative Methods for Research in Social Sciences

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|---|---|
| **Number of ECTS credits** | 5 |
| **Typology** | *OP* |
| **Temporary organization** | *1.1* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • Epistemological definitions and concepts applied to research design.<br>• Bibliographic review on topics of scientific interest in the field of Environmental Science and Technology.<br>• Setting a research objective.<br>• Research methods.<br>• Research from an ethical perspective.<br>• More appropriate sources of information.<br>• Data collection, processing and analysis techniques.<br>• Qualitative analysis software (Nvivo). |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA28: Describe the epistemological concepts and design logic of qualitative and quantitative research in social sciences. (KT01)*<br>*KA29: Define the different sources of information and data collection, processing and analysis techniques used in social science research (including the necessary software), recognising their usefulness. (KT01)* |
| | **Skills:**<br>*SA28: Prepare exhaustive bibliographic reviews (systematic and narrative) on topics of interest in the field of Environmental Science and Technology. (ST03)*<br>*SA29: Apply self-directed learning to acquire, deepen and update research and data analysis methodologies (interviews, focus groups, participant observation, etc.) in the field of social sciences. (ST05)*<br>*SA30: Determine the most appropriate methodological articulation based on the research questions posed in the field of social sciences. (ST08)* |
| | **Competencies:**<br>*CA27: Formulate research questions that integrate the interactions between ecological, economic, and social systems to address sustainability challenges, considering their ethical and social implications. (CT01)*<br>*CA28: Design research in the social sciences, selecting and applying appropriate qualitative methods and techniques to address complex environmental problems. (CT02)*<br>*CA29: Critically evaluate the ethical and social implications in the design of research in the field of social sciences. (CT06)* |

| **Training Activities** | | Directed | Supervised | Autonomous |
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| | Hours | 30 | 18 | 77 |
| | % face-to-face attendance | 100% | 10% | 0% |

| A12: Environmental Law: Essential Foundations for Professionals | |
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| **Number of ECTS credits** | 5 |
| **Typology** | *OP* |
| **Temporary organization** | *1.1* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | BLOCK 1: GENERAL PART<br>• Environmental protection and sustainability objectives as an object of law. Principles. Environmental planning.<br>• The international framework for the legal protection of the environment. The international legal regime applicable to climate change.<br>• The importance of environmental law in the European Community. Actors, competencies, principles. The normative instruments used and their link with domestic law. Exercise of powers. The difference and complementarity with the strategic European programmes in environmental matters. The Eighth General Program until 2030 and the "Green Deal".<br>• Public Administration and environmental protection. Competencies, and environmental administrative organization.<br><br>THEMATIC BLOCK 2. Cross-cutting mechanisms<br>• Environmental information, citizen and group participation, and access to justice in the protection of the environment. The right of citizens to participate in the most important decisions on environmental protection.<br>• Responsibilities for environmental damage. Basic features of criminal, civil, administrative liability and the so-called environmental liability applied to the matter.<br>• The environmental assessment of plans and programmes or strategic environmental assessment. The environmental impact assessment of works projects, facilities and activities.<br>• Environmental prevention and control through permits of potentially polluting activities.<br>• Traditionally voluntary instruments and their evolution. Incentives for environmental protection. Environmental certification: Ecolabel, Green Claims/green washing, EMAS, ISO's; Corporate social responsibility.<br><br>THEMATIC BLOCK 3: Regulated sectors.<br>• Protection of inland waters.<br>• Protection of the coastline and the marine environment.<br>• Air pollution, noise pollution; Light pollution and bad odours: their legal treatment.<br>• The regime applicable to climate change.<br>• Legal regime for waste and contaminated soil. Economy. Circular. Hazardous substances.<br>• The protection of natural resources. Special protection areas. The protection of biodiversity and the protection, management and planning of the landscape.<br>• The integration of the environmental component in the development and implementation of sectoral public policies: transport, energy, agriculture, etc. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA30: Describe the European Union and international legal framework for environmental protection, including the regime applicable to climate change. (KT01, KT04)*<br>*KA31: Explain the instruments of environmental prevention and control (strategic environmental assessment, environmental impact assessment, liability for environmental damage, permits) and voluntary instruments such as environmental certification and Corporate Social Responsibility (CSR). (KT01)*<br>*KA32: Distinguish the specific legal protection regimes for different regulated environmental sectors such as water, coastline, atmosphere, waste, contaminated soils and biodiversity. (KT03, KT05)* |
| | **Skills:** |

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| | *SA31: Interpret current environmental regulations by applying them to specific situations and problems of sustainable management. (ST01)*<br>*SA32: Evaluate the integration of the environmental component in sectoral public policies from a legal perspective and considering the scope of application of each regulation. (ST08)* | | | |
| | **Competencies:**<br>*CA30: Analyze complex socio-environmental problems from a legal perspective, based on critical judgments on the application and effectiveness of environmental regulations. (CT01)*<br>*CA31: Critically evaluate the ethical and social implications of environmental regulations and policies. (CT06)*<br>*CA32: Demonstrate ethical responsibility and respect for fundamental rights and duties in the field of environmental law. (CT08)* | | | |
| **Training Activities** | | Directed | Supervised | Autonomous |
| | Hours | 30 | 15 | 80 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A13: Corporate Social Responsibility: Company Sustainability Report

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|---|---|
| **Number of ECTS credits** | 5 |
| **Typology** | *OP* |
| **Temporary organization** | *1.2* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • Concept and theoretical perspectives of CSR.<br>• Strategic management and CSR.<br>• Leading international initiatives related to CSR.<br>• Environmental management tools.<br>• CSR communication. EU standards and sustainability reporting: environmental and social risks. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA33: Define the concept and theoretical perspectives of Corporate Social Responsibility (CSR), as well as the changing relationship between companies, society and public administrations. (KT01)*<br>*KA34: Describe key international initiatives and regulation related to the different dimensions of CSR (economic, environmental, social, corporate governance). (KT01)*<br>*KA35: Relate CSR to the strategic management of organisations and business management. (KT01)* |
| | **Skills:**<br>*SA33: Apply methodologies for CSR management and communication, including the use of European Union standards. (ST01)*<br>*SA34: Apply self-directed learning strategies that allow continuous updating in the field of CSR and adaptation to its new social demands. (ST05~~)~~* |
| | **Competencies:**<br>*CA33: Work effectively in an international and multidisciplinary context to address CSR-related sustainability challenges. (CT04)*<br>*CA34: Critically evaluate the ethical and social implications of CSR strategies. (CT06)*<br>*CA35: Propose measures to reduce social inequalities, with special attention to gender inequalities in the field of CSR and the sustainability report. (CT07)* |

**Training Activities**

| | Directed | Supervised | Autonomous |
|---|---|---|---|
| Hours | 30 | 18 | 77 |
| % face-to-face attendance | 100% | 10% | 0% |

## A14: Sustainable Transport and Mobility Policies

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|---|---|
| **Number of ECTS credits** | 5 |
| **Typology** | *OP* |
| **Temporary organization** | *1.2* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • Conceptual differences between mobility and transport.<br>• Spatial and urban factors in the configuration of mobility.<br>• Socioeconomic and sociopsychological factors that influence travel behavior.<br>• Environmental externalities of the transport system.<br>• Social consequences of transport: spatial justice, exclusion and economic development.<br>• Impacts on public health and well-being.<br>• Strategies to reduce dependence on the car.<br>• Emerging technologies and their impact on urban mobility.<br>• Acceptance and opposition to transformative urban policies. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA36: Differentiate the concepts of mobility and transport, as well as the factors that influence them, and their implication in urban sustainability. (KT01)*<br>*KA37: Explain the environmental externalities and social consequences of the transport system, including spatial justice, social exclusion in access to mobility, impacts on economic development, and public health and well-being (KT01)*<br>*KA38: Identify emerging technologies and their impact on urban mobility, as well as acceptance and opposition to transformative urban policies. (KT01)* |
| | **Skills:**<br>*SA35: Analyse specific mobility problems to identify strategies to reduce dependence on the car. (ST01)*<br>*SA36: Select key actors in the design and implementation of sustainable mobility policies. (ST07)* |
| | **Competencies:**<br>*CA36: Evaluate the environmental and social impacts of transport systems to support proposals for sustainable mobility management. (CT03)*<br>*CA37: Communicate the conclusions on transport and mobility policies to specialised and non-specialised audiences, clearly and unambiguously, adapting the message to the context. (CT05)*<br>*CA38: Propose measures to reduce social inequalities in access to and use of transport. (CT07)* |

**Training Activities**

| | Directed | Supervised | Autonomous |
|---|---|---|---|
| Hours | 30 | 18 | 77 |
| % face-to-face attendance | 100% | 10% | 0% |

## A15: Urban Ecology

| | |
|---|---|
| **Number of ECTS credits** | 5 |
| **Typology** | *OP* |
| **Temporary organization** | *1.2* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • Topics explored: Urban sustainability, resilience, vulnerability, environmental justice, nature values, green infrastructure, nature-based solutions, ecosystem services, socio-ecological-technological systems, urban metabolism, circular economy, industrial ecology and urban agriculture.<br>• Tools and methodologies for the environmental improvement of cities at different scales (neighbourhoods, buildings and urban environment): spatial analysis, environmental modelling, multi-criteria decision analysis, socio-computational analysis, transdisciplinary research, co-creation, industrial ecology tools applied to cities and their spaces such as: life cycle assessment, ecodesign and material flow analysis. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA39: Define key concepts of urban ecology such as urban sustainability, resilience, vulnerability, environmental justice, green infrastructure, nature-based solutions and ecosystem services. (KT01)*<br>*KA40: Relate the concepts of socio-ecological-technological systems, urban metabolism, circular economy and industrial ecology with the study of cities. (KT02)*<br>*KA41: Describe the fundamentals of urban agriculture and its role in the sustainability of cities. (KT01)* |
| | **Skills:**<br>*SA37: Apply tools and methodologies such as spatial analysis, environmental modelling and multi-criteria assessment for the environmental improvement of cities. (ST01)*<br>*SA38: Critically select methods for valuing ecosystem services to apply them to urban planning and management issues, involving citizens and other agents. (ST07)* |
| | **Competencies:**<br>*CA39: Analyze complex socio-environmental problems in urban environments, considering the interaction between ecological, economic, and social systems. (CT01)*<br>*CA40: Work effectively in an interdisciplinary context to address complex urban sustainability challenges. (CT04)*<br>*CA41: Propose measures to reduce socio-environmental inequalities in the development and planning of sustainable cities. (CT07)* |

| **Training Activities** | | Directed | Supervised | Autonomous |
|---|---|---|---|---|
| | Hours | 30 | 18 | 77 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A16: Climate Change

| | |
|---|---|
| **Number of ECTS credits** | 5 |
| **Typology** | *OP* |
| **Temporary organization** | *1.2* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • Patterns, causes and mechanisms of natural climate change in ocean and terrestrial systems.<br>• Attribution of recent climate change to anthropogenic activities.<br>• Tools for the study of climate, including numerical modelling, impacts of climate change and their consequences. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA42: Describe the patterns, causes and mechanisms of climate change, both natural and anthropogenic, in ocean and terrestrial systems. (KT04)*<br>*KA43: Describe the tools and methodologies for the study of climate, including numerical modelling, and their application in the understanding of climate change. (KT01)*<br>*KA44: Describe the current and future impacts of climate change and its consequences on natural and social systems. (KT04)* |
| | **Skills:**<br>*SA39: Independently select information in the scientific literature to support and contextualise research in the field of climate change. (ST03)*<br>*SA40: Continuously update one's own knowledge in climate science and its challenges through self-directed learning strategies. (ST05)*<br>*SA41: Critically select appropriate methodologies for climate vulnerability and risk assessment at different scales. (ST08)* |
| | **Competencies:**<br>*CA42: Analyse the complexity of climate science and the challenges of climate change, integrating knowledge and formulating critical judgements on the associated social and ethical responsibilities. (CT01)*<br>*CA43: Communicate conclusions about climate change, its impacts and coping strategies to specialised and non-specialised audiences in a clear and unambiguous way. (CT05)* |

**Training Activities**

| | Directed | Supervised | Autonomous |
|---|---|---|---|
| Hours | 30 | 18 | 77 |
| % face-to-face attendance | 100% | 10% | 0% |

## A17: Biocultural Diversity

| | |
|---|---|
| **Number of ECTS credits** | 5 |
| **Typology** | *OP* |
| **Temporary organization** | *1.2 ~~1st~~* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • Understanding human-nature interactions through the lens of historical ecology and ethnobiology.<br>• The intersections between biological, linguistic and cultural diversity.<br>• Threats to indigenous and local knowledge systems.<br>• Synergies and tensions between Western and indigenous knowledge systems.<br>• Biocultural approaches to conservation.<br>• Environmental justice, decolonization and indigenous peoples.<br>• Maintaining biocultural diversity: rights to land and culture.<br>• Biocultural approaches to health.<br>• The contributions of local knowledge to climate research.<br>• Risks and opportunities of digital technologies and participatory mapping with communities. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA45: Describe the concept of biocultural diversity, the intersections between biological, linguistic and cultural diversity, and human-nature interactions analyzed from historical ecology and ethnobiology. (KT01)*<br>*KA46: Describe biocultural approaches to conservation and health, as well as mechanisms for maintaining biocultural diversity (land and cultural rights) in relation to environmental justice and decolonization. (KT01)*<br>*KA47: Explain the threats to indigenous and local knowledge systems, and the synergies and tensions with scientific knowledge systems, including the role of digital technologies and their risks and opportunities. (KT07)* |
| | **Skills:**<br>*SA42: Select information in the scientific literature to inform and contextualize research on biocultural diversity. (ST03)*<br>*SA43: Determine strategies for the co-production of knowledge with local communities in biocultural diversity studies. (ST06)*<br>*SA44: Select relevant community and institutional actors in biocultural diversity and conservation projects. (ST07)* |
| | **Competencies:**<br>*CA44: Communicate complex ideas and opinions about biocultural diversity, its challenges and conservation approaches, to specialized and non-specialized audiences. (CT05)*<br>*CA45: Critically evaluate the ethical and social implications of interventions in contexts of biocultural diversity. (CT06)* |

| **Training Activities** | | Directed | Supervised | Autonomous |
|---|---|---|---|---|
| | Hours | 30 | 18 | 77 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A18: Water Management

| | |
|---|---|
| **Number of ECTS credits** | 5 |
| **Typology** | *OP* |
| **Temporary organization** | *1.2* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • General aspects of water resources management models.<br>• Governance of large conventional hydraulic infrastructures: reservoirs and transfers.<br>• Governance of large alternative hydraulic infrastructures: desalination and reuse.<br>• Governance of decentralized systems: groundwater, graywater, and rainwater in urban environments.<br>• Water demand management: practices, economics and technology.<br>• Hidden water flows: water-energy nexus, virtual water and water footprint.<br>• Water poverty and water as a social need.<br>• Commodification of water: privatization and (re)municipalization.<br>• Risk management: droughts and floods. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA48: Explain the characteristics of the governance of hydraulic infrastructures, both conventional (reservoirs, transfers) and alternative (desalination, reuse). (KT01)*<br>*KA49: Describe governance models for decentralized water systems, including groundwater, graywater, and rainwater in urban environments. (KT01)*<br>*KA50: Define the concepts of hidden water flows (water-energy nexus, virtual water, water footprint), water poverty, water as a social need, and commodification of water. (KT06, KT07)* |
| | **Skills:**<br>*SA45: Propose solutions for the management of water demand, considering its complexity and applying technological and economic criteria. (ST01)*<br>*SA46: Analyse the relevant actors in water governance, including administrations, users and civil society. (ST07)* |
| | **Competencies:**<br>*CA46: Design new forms of governance and strategies to address water challenges based on a comprehensive analysis of water that considers its ecological, economic and social dimensions, including risk management. (CT02)*<br>*CA47: Demonstrate ethical responsibility by promoting water governance that respects fundamental rights, gender equity, and democratic values. (CT08)* |

**Training Activities**

| | Directed | Supervised | Autonomous |
|---|---|---|---|
| Hours | 30 | 18 | 77 |
| % face-to-face attendance | 100% | 10% | 0% |

## A19: Tools for Analysing the Metabolism of Societies

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|---|---|
| **Number of ECTS credits** | 5 |
| **Typology** | *OP* |
| **Temporary organization** | *1.2* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • Introduction to the metabolism of societies.<br>• Biophysical indicators of sustainability.<br>• Case study: The energy transition in Spain.<br>• Material Flow Analysis.<br>• Input-Output Analysis.<br>• Land and Time Budget Analysis.<br>• Integrated Multiscale Analysis of the Metabolism of Societies.<br>• Integration of methodologies through system dynamics. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA51: Describe the concept of metabolism of societies and biophysical indicators of sustainability. (KT01)*<br>*KA52: Explain the methodologies of Material Flow Analysis (MFA), Input-Output Analysis (IOA) and Land and Time Budget Analysis. (KT01, KT02)*<br>*KA53: Describe the approach of the Integrated Multiscale Analysis of the Metabolism of Societies and the integration of methodologies through system dynamics. (KT01)* |
| | **Skills:**<br>*SA47: Calculate biophysical indicators to analyse the metabolism of societies in specific case studies, such as the energy transition. (ST01, ST05)*<br>*SA48: Manage the specialized programs of Material Flow Analysis, Input-Output Analysis and Land and Time Budget Analysis to assess sustainability. (ST02)*<br>*SA49: Select the appropriate methodologies for the analysis of the metabolism of societies at different spatial and temporal scales. (ST08)* |
| | **Competencies:**<br>*CA48: Design integrated methodologies for analysing the metabolism of societies to address sustainability challenges. (CT02)*<br>*CA49: Critically evaluate the ethical and social implications of the metabolism models of societies. (CT06)* |

| **Training Activities** | | Directed | Supervised | Autonomous |
|---|---|---|---|---|
| | Hours | 30 | 15 | 80 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A20: Strategies for Mitigation and Adaptation to Global Change

| | |
|---|---|
| **Number of ECTS credits** | 5 |
| **Typology** | *OP* |
| **Temporary organization** | *1.2* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | • Identify current socio-ecological challenges.<br>• Conceptual framework of mitigation and adaptation strategies to global change.<br>• Design of global change mitigation and adaptation strategies to promote resilience and resilience to the effects of climate change (nature-based solutions).<br>• Valorization of ecosystem services.<br>• Follow-up and monitoring of ecosystem services.<br>• Assessment of global change mitigation and adaptation strategies in ecosystem services. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA54: Describe the conceptual framework of global change mitigation and adaptation strategies. (KT04)*<br>*KA55: Explain current socio-ecological challenges and the role of nature-based solutions in mitigating and adapting to global change. (KT01)*<br>*KA56: Describe the valorization of ecosystem services as a component of adaptation strategies. (KT05)* |
| | **Skills:**<br>*SA50: Apply tools and methods for the follow-up and monitoring of ecosystem services, as well as to assess the impact of mitigation and adaptation strategies on them. (ST02)*<br>*SA51: Determine strategies for the co-production of mitigation and adaptation measures to global change, in collaboration with local actors and communities. (ST06)* |
| | **Competencies:**<br>*CA50: Design innovative proposals that incorporate nature-based solutions to address the effects of climate change. (CT02)*<br>*CA51: Develop sustainable management solutions through mitigation and adaptation strategies, based on the assessment of the impacts of global change. (CT03)*<br>*CA52: Propose well-founded measures to reduce socioeconomic inequalities in the implementation of mitigation and adaptation strategies to global change. (CT07)* |

| **Training Activities** | | Directed | Supervised | Autonomous |
|---|---|---|---|---|
| | Hours | 30 | 15 | 80 |
| | % face-to-face attendance | 100% | 10% | 0% |

## A21: Work Placement

| | |
|---|---|
| **Number of ECTS credits** | 5 |
| **Typology** | *PRO* |
| **Temporary organization** | *1.2* |
| **Language** | *Spanish* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | The student joins the tasks assigned to companies in the environmental sector (in the broad sense), as well as in the environmental departments of institutions (companies, research centers, and public administrations). Such tasks may include the preparation of studies, reports, assessments, work plans and other similar work. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA57: Relate the theoretical and methodological knowledge acquired in the master's degree with the professional tasks and problems of an institution in the environmental sector. (KT01)* |
| | **Skills:**<br>*SA52: Apply knowledge of environmental science and technology to carry out environmental studies, reports or assessments or work plans in a professional environment. (ST01)*<br>*SA53: Appropriately and effectively use Information and Communication Technologies (ICT), together with qualitative techniques and statistical tools, for diagnosis, proposal of solutions and transmission of ideas and results in professional contexts of environmental studies. (ST02)*<br>*SA54: Communicate efficiently, orally and in writing, knowledge and results in the field of environmental, economic and social sustainability, in professional environments. (ST04)*<br>*SA55: Execute the tasks assigned in the professional environment of environmental studies with responsibility and proactivity, identifying opportunities for improvement. (ST05)* |
| | **Competencies:**<br>*CA53: Integrate knowledge in a professional environment related to environmental, economic and social sustainability, formulating critical judgments based on social and ethical responsibilities. (CT01)*<br>*CA54: Design creative strategies and solutions to face contemporary environmental challenges, applying assessment and communication instruments and techniques sensitive to a diversity of interests and audiences. (CT02, CT05)*<br>*CA55: Work cooperatively in international and interdisciplinary contexts in the field of environmental studies, assuming and respecting the different roles and responsibilities of team members, as well as the established levels of hierarchy and coordination. (CT04)* |

**Training Activities**

| | Directed | Supervised | Autonomous |
|---|---|---|---|
| Hours | 0 | 120 | 5 |
| % face-to-face attendance | 100% | 10% | 0% |

## A22: Master's Degree Dissertation

| | |
|---|---|
| **Number of ECTS credits** | 10 |
| **Typology** | *TFM* |
| **Temporary organization** | *1.2* |
| **Language** | *English* |
| **Modality** | *Face-to-face* |
| **Contents of the subject** | Preparation of students for future research work, i.e. a doctoral thesis or an R+D+i project in a company or administration.<br>See the TFM section of this report. |
| **Learning outcomes of the SUBJECT** | **Knowledge:**<br>*KA58: Relate the fundamental and advanced and interdisciplinary methodological knowledge of environmental, economic and social sustainability, for the preparation of a research or innovation work. (KT01)* |
| | **Skills:**<br>*SA56: Independently select relevant information from the scientific literature and use research methodologies to propose and contextualise a master's thesis in the field of environmental, economic and social sustainability, considering its spatial scale. (ST03, ST08)*<br>*SA57: Execute a research or innovation project in the field of sustainability, including its planning and organisation, with autonomy and under the corresponding academic supervision. (ST01, ST05)*<br>*SA58: Prepare the Master's Thesis report following guidelines for the format and style of scientific publications. (ST04)* |
| | **Competencies:**<br>*CA56: Design innovative solutions or research approaches to current environmental challenges within the research lines of the master's degree. (CT02)*<br>*CA57: Critically evaluate the results of research or innovative solutions in environmental studies, interpreting their implications and demonstrating coherence in analysis and discussion. (CT03)*<br>*CA58: Effectively communicate the conclusions, knowledge and arguments of the Master's thesis, in a clear and unambiguous way, adapting the message to the context and adopting a critical approach. (CT05)*<br>*CA59: Demonstrate ethical responsibility and respect for fundamental rights and duties in the development of the TFM in the field of environmental, economic and social sustainability. (CT08)* |

**Training Activities**

| | Directed | Supervised | Autonomous |
|---|---|---|---|
| Hours | 6 | 40 | 204 |
| % face-to-face attendance | 100% | 10% | 0% |