

**Interdisciplinary Concepts on Environmental,
Economic and Social Sustainability**

Code: 43068
ECTS Credits: 15

Degree	Type	Year	Semester
4313784 Interdisciplinary Studies in Environmental, Economic and Social Sustainability	OB	0	A

Contact

Name: Neus Martí Sanz

Email: Neus.Marti@uab.cat

Teachers

Jordina Belmonte Soler

Carme Miralles Guasch

Mario Giampietro

María Antonia Casellas Puigdemasa

Martí Boada Juncà

Neus Martí Sanz

Use of languages

Principal working language: english (eng)

External teachers

Gonzalo Gamboa

Juan Cadillo Benalcazar

Tarik Serrano

Zora Kovacic

Prerequisites

no prerequisites

Objectives and Contextualisation

This module aims to ensure the interdisciplinarity of environmental studies. Every environmental issue must be tackled considering natural as well as economic and social aspects in order to guarantee a sustainable solution for future generations.

This is why a review of the essential concepts related to the three itineraries of this Master's program is conducted. Altogether, new concepts related to ongoing research conducted at ICTA and partner Departments are introduced. Lastly, topics related to communication and academic diffusion are also to be studied.

This is a module divided between the first and second semester. Nevertheless, as this is an introductory module, most part of the lectures is set in the first semester.

In the first semester the core concepts related to each of the three itineraries are discussed, and lecturers from each of the specialties will take part in the presentations. In this semester a three day fieldwork excursion to Alinyà will be also conducted. This implies that this module contains a considerable workload.

Lectures in the second semester are devoted to topics related to communication and academic diffusion, also related to the Master's Thesis. This is why students are trained in a practical exercise with this specific objective.

Skills

- Analyse how the Earth functions on a global scale in order to understand and interpret environmental changes on the global and local scales.
- Analyse, summarise, organise and plan projects related to the environmental improvement of product, processes and services.
- Apply knowledge of environmental and ecological economics to the analysis and interpretation of environmental problem areas.
- Apply knowledge of environmental engineering to purification and decontamination in different environments.
- Apply the acquired knowledge and methodologies of environmental, economic and social sustainability to the planning and control of environmental management policies and projects.
- Communicate orally and in writing in English.
- Seek out information in the scientific literature using appropriate channels, and use this information to formulate and contextualise research in environmental sciences.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.

Learning outcomes

1. Apply a multi-criteria analysis to a system.
2. Communicate orally and in writing in English.
3. Compare and make an objective selection from among the different possible techniques in an industrial process, applying criteria of environmental sustainability.
4. Distinguish the Earth's subsystems and know its interactions.
5. Know the different options for waste treatment.
6. Know the economic tools that can be applied to problems of environmental policy.
7. Know the main systems for purifying water and gases.
8. Know the processes of prevention, re-use, recycling and valorisation of waste.
9. Know the two fundamental tools for evaluation problems: Cost-benefit analysis and multi-criteria analysis.
10. Seek out information in the scientific literature using appropriate channels, and use this information to formulate and contextualise research in environmental sciences.
11. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.

Content

FIRST SEMESTER

FIRST PART: The Metabolic Pattern of Social-Ecological Systems: A tool for structuring perceptions and representations of sustainability

Prof: Mario Giampietro (mario.giampietro@uab.cat)

Lecturers: Juan Cadillo Benalcazar, Zora Kovacic, Tarik Serrano Tovar

Assignment: The assignment will be provided and explained during the first class.

DAY 1 - Tuesday, 26 September 2017 (15:00-18:00)

Mario Giampietro

1a. It is not a post-truth world, it is a society using obsolete narratives to explain it

The first class will illustrate a series of blunders in popular narratives currently used to discuss sustainability issues: (i) The role of imports/externalization in relation to the idea of the Circular Economy; (ii) The Bioeconomy as a source of innovations for perpetual economic growth; (iii) the lessons learned from the German 'energiewende' about intermittent sources of electricity. The success of these popular narratives is a clear sign of concern: Are we living in a world defined by the delirium of urban elites?

1b. The clash between the scientific dream of prediction and control and complexity: Do we have effective tools to deal with the predicament of sustainability?

A series of conventional indicators commonly used in sustainability science are examined to illustrate a systemic epistemological error found in quantitative analysis, that of ignoring the complex nature of adaptive, self-organizing systems such as social-ecological systems. We identify and discuss the epistemological challenges that complicate quantitative characterizations in sustainability science. The examples clearly show that it is time to move away from a science based on reductionism to a science based on complexity.

DAY 2- Wednesday, 27 September 2017 (16:00-19:00)

Mario Giampietro

2a. The concept of the metabolic pattern of social-ecological systems

Several theoretical concepts are introduced: (i) The conceptual difference between material flow accounting on the one hand and metabolic analysis on the other hand; (ii) Basic features of social-ecological systems; (iii) hierarchical levels of analysis and the relation between the internal and external view of metabolic processes; (iv) feasibility of the metabolic pattern (compatibility with external biophysical constraints); (v) viability of the metabolic pattern (compatibility with internal socio-economic constraints); (vi) desirability of the metabolic pattern (compatibility with normative values and institutions); (vii) taming the ambiguity of the concept of 'holon' or how to handle the relation between structural and functional elements.

2b. Illustrating applications of integrated assessment of the metabolic pattern of social-ecological systems

Three case studies are presented to illustrate the approach: (i) Scenarios of alternative land uses in Mauritius; (ii) The fragility of the grain basket of India (Punjab); (iii) Options for salmon production in Norway.

DAY 3 – Thursday, 28 September 2017

From 10:00 to 13:00

Juan Cadillo Benalcazar and Mario Giampietro

3a. Integrated analysis of the metabolic pattern of food in Ecuador (Juan Cadillo Benalcazar)

This class illustrates a technical analysis of the metabolic pattern of food in Ecuador based on an application of the Multi-Scale Integrated Assessment of Societal and Ecosystem Metabolism (MuSIASEM). MuSIASEM makes it possible to establish relations of coherence across different quantitative assessment defined using different metrics and different scales of analysis. It also establishes a bridge between different dimensions (demographic, economic, social, technological) and scales of analysis using data that can be geo-referenced.

3b. A participatory integrated assessment of the metabolic pattern of the Solid Waste Management System in Naples (Mario Giampietro)

This class illustrates an application of the MuSIASEM approach combined with participatory processes: The metabolic pattern of the Solid Waste Management System of Naples, Italy carried out within the context of an EU research project. This example shows the importance of mixing technical analyses and participatory processes to guarantee the quality of the process of production and use of quantitative information in the process of decision-making.

From 15:00 to 18:00

Zora Kovacic and Tarik Serrano Tovar

3c. The metabolic pattern of shanty towns(Zora Kovacic)

The class will discuss the sustainability of shanty towns and provide examples of the application of the approach to the study of (i) human activity, demographic change and labour dynamics in the context of "increasing urban population", (ii) household metabolism and non-linearities in energy use in relation to energy transition discourses, (iii) the role of technology and innovation in sustainability policies in the context of the Third World and informality.

3d. Integrated analysis of the metabolic pattern of a farm using desalinated water in the Canary Islands

This class focuses on an integrated assessment of a system of agricultural production in the island of Gran Canaria (Canary Islands) that uses alternative energy for desalination of irrigation water. This case illustrates the nexus between water, energy and food. The particular approach used is based on the concept of processors and encompasses both the biophysical and economic dimension of analysis. The use GIS within the analysis is demonstrated.

DAY 4 – Friday 29 September 2017 (15:00 - 18:00)

Mario Giampietro

4a The problematic use of reductionist science for governance: post-normal science

This class starts by explaining what generated the unconditional acceptance of the Cartesian dream of prediction and control over nature in modern society that has led to the dangerous attractor of "science-religion". Following, basic epistemological principles are used to explain the fragility of reductionist science in guiding policy. Several new concepts, needed for the discussion, are introduced: the difference between narratives and story-telling, and the nature of the semiotic process used in society to generate and validate knowledge.

4b So where do we go from here?

This class is dedicated to a participatory reflection on the material presented in this week using the following cases as a basis for discussion: (i) actual trends in the technological development of modern agriculture; (ii) actual trends in the development of the energy sector; (iii) the double overhead implied in the demographic and economic development of 'welfare countries'.

SECOND PART: Integrative evaluation approaches and Social Multi-Criteria Evaluation

Prof: Neus Martí Sanz (Neus.marti.sanz@gmail.com)

Evaluation becomes a crucial exercise when public informed-based decision making processes are promoted. The nature of problems related to environmental sustainability requires an appropriated evaluation approach consistent with their characteristics. Social multi-criteria evaluation (SMCE) is proposed as a tool to integrate different scientific languages in a public choice framework, where the whole "civil society" and ethical concerns on future generations have to be considered along with policy-makers and market conditions.

The main topics tackled in this course are:

DAY 1 - Friday, 29 september 2017 (10:00 - 13:00)

Evaluation for an informed-based decision-making

- Dealing with a Complex World: Multiple Dimensions, Values and Scales
- The evaluation purpose
- Public informed-based decision-making processes
- Appropriated evaluation approaches
- Examples of appropriated evaluation approaches

DAY 2 - Monday, 2 october 2017 (15.00-18.00)

The Social Multi-Criteria Evaluation (SMCE)

Invited lecturer: Gonzalo Gamboa

- What is Multi-Criteria Evaluation?
- Social Multi-Criteria Evaluation and Sustainability Issues
- Technical and social incommensurability
- Structuring a SMCE process
- The quality of the SMCE process: outputs & process
- Examples of real-world SMCE

DAY 3. Tuesday, 3 october 2017 (15:00 - 17:00)

Basic operational concepts

Invited lecturer: Gonzalo Gamboa

- The evaluability issue
- Preference Modelling in SMCE
- Measurement scales
- Uncertainty in the criterion scores
- Compensability and the Meaning of Weights
- The Total Comparability Axiom: Multi-Attribute Value Functions
- The Partial Comparability Axiom: Outranking Methods
- The Issue of Consistency: Lessons Learned from Social Choice Literature
- Examples of software applications

DAY 4. Wednesday, 4 october 2017 (15:00 - 17:00)

Evaluation in the framework of environmental conflicts

Invited lecturers: EJOLT team

- The nature and causes of environmental conflicts
- Mapping the environmental conflicts
- Challenges in assessing environmental conflicts

THIRD PART: visit to Alinya Campus

Prof: Jordina Belmonte & Marti Boada (jordina.belmonte@uab.cat; marti.boada@uab.cat)

Alinyà campus is a natural space that the Fundació Catalunya-La Pedrera (FCLP) owns and devotes to teaching and research activities. For more information visit:

<http://fundaciocatalunya-lapedrera.com/ca/content/muntanya-daliny%C3%A0-la-rectoria>.

UAB and FCLP signed a contract in 2012 to facilitate the development of activities to UAB members in Alinyà. This campus will offer us the opportunity to learn natural sciences and socio-ecological aspects and to assist to explanations on projects that are being run in the area, at the time that all participants get toknow better each other and begin to collaborate and work together.

A detailed agenda on the travel to Alinyà (that will be done by bus and organized by ICTA) and the activities will be provided at the beginning of the Master. The students will be asked to contribute to the expenses of the travel and stay. The amount required will be definitively established by that time and will not exceed 75 €/person.

Aula activities, talks and debates related with the Knowledge and the sustainable use of the local environment. Main speakers: Martí Boada (ICTA), Jordina Belmonte (ICTA), Josep Germain (ICTA collaborator), Sílvia Garrigós (FCLP).

- Introduction to Alinyà: geomorphology, biodiversity, biogeography.

- Livestock in the Alinyà valley and the management of pastures
- Sustainable use of the local environment and practical interpretation of the landscape from a socioecological perspective. Talk-debate.

Field activities:

- Visit to the "Rectoria" and the "Agrobotiga" (organic food store) in Alinyà (Llobera). Talk-debate about invigorating the economy of Alinyà Valley. Main speakers: Martí Boada (ICTA), Jordina Belmonte (ICTA), Sílvia Garrigós (FCLP) and all master students in the debate.
- Visit to the site of the EU Life Project for CO₂ fixation through an apple plantation combined with other species to increase fixation. Comments on other experimental projects from FCLP. Staff: Xavier Escuté (FCLP).
- Visit to the supplementary feeding site and presentation of the Project on the reintroduction of the black vulture. Excursion on foot from Alinyà to the "Ermita de Sant Ponç". Staff: FCLP.

FOURTH PART: Urban processes

Prof. Carme Miralles (carmes.miralles@uab.cat).

Coordinator: Mónica Maciejewska (monikawiktoria@gmail.com)

Attendance to the congress: VIII Seminario Internacional de la Red de Investigación sobre Areas Metropolitanas de Europa y America Latina (RIDEAL): Las escales de las metrópolis: Lejanía versus proximidad (8, 9 and 10 october, 2017).

The congress sessions will be in the center of Barcelona, during the morning and afternoon. The schedule details and place will be given at the beginning of the course.

Mónica Maciejewska (monikawiktoria@gmail.com) will be the teacher in charge of coordinating the students attendance.

SECOND SEMESTER

FIFTH PART: Communication and academic diffusion, also related to the Master's thesis

Prof. Antònia Casellas (antonia.casellas@uab.cat)

GROUP 1. From February 7th to March 20th. 10-13h

GROUP 2. From February 2th to March 20th. 15-18h

Course Purpose and Objectives

The purpose of the course is to introduce students to the fundamentals of writing and presentation in the context of academic work. The main course goal is to help master students with the specific requirements of graduate-level articles, reports, theses and presentations. To this goal, we will specifically work on academic practice of research design, summary-critique, synthesis and presentations.

Topics covered in the class include discussion of Critical/Academic Writing, Papers Structure, Abstracts, Introductions/Conclusions, Literature Review, Evidence, Citation Style, Sources and Quotations, Plagiarism, Academic Sources, and Library Resources. We will also address strategies for presenting information. The course provides opportunities for questions, discussion and exercises.

Specific Goals

- To comprehend the overall and internal organization of an academic essay
- To use search tools to locate appropriate sources and to evaluate and select sources for relevance
- To paraphrase and cite sources and to write effective and coherent paragraphs
- To generate ideas from sources to develop content and write an effective thesis statement

- To give critical peer feedback and to use peer and teacher feedback to edit writing
- To skim for main idea(s) in reading and develop reading speed
- To summarize and paraphrase information in a text
- To use communication strategies to participate in group and class discussions
- To select, compile, and synthesize information for an oral presentation
- To deliver an effective oral presentation and to present information using digital tools

Skills

- Improve critical reading and writing skills
- Improve capacity to identify a range of information sources
- Identify the structural features of academic writing
- Learn to take into consideration the expectations of the target audience
- Use effectively the work of others in writing, including use of sources and citation methods

Learning outcomes

- 1) Demonstrate understanding of writing as a series of tasks, including finding, evaluating, analyzing, and synthesizing appropriate sources, and as a process that involves composing, editing, and revising.
- 2) Demonstrate critical reading and analytical skills, including understanding an argument's major assertions and assumptions, and how to evaluate its supporting evidence.
- 3) Demonstrate research skills and capacity to integrate ideas and apply the conventions of attribution and citation correctly.
- 4) To use an appropriate range of argument types and demonstrate a good command of both general and specialized vocabulary.
- 5) Use writing and reading for inquiry, learning, thinking, and communicating.
- 6) Integrate ideas with those of others.
- 7) Develop flexible strategies for generating, revising, editing, and proof-reading
- 8) Practice appropriate means of documenting work.
- 9) Demonstrate capacity to use a variety of skills and approaches when writing different papers.
- 10) Target the various audiences by adapting writing to the expectations of audiences.

Content

The **assignment requirements** of the sessions include:

- 1) Readings: We will do readings of journal articles selected by professor and students. The readings will be discussed in class.
- 2) Short Writings: Throughout the classes students will complete several short writing assignments in class. These pieces will be exercises in employing concepts learned in class/reading, and will be incorporated into the short essays.
- 3) Short Essays: Students will write two individual short essays:
 - (a) The first essay is a Summary-Critique Essay: Students select a book from their fields of study and write a summary and critique of it.
 - (b) The second essay is a Synthesis Essay: Students write an Introduction for a topic they are working on in their fields of study related to a research question.

4) Class presentation: During the last sessions students will present their Research Question and the Synthesis Essay under the directions of the professor and will receive feedback from the class.

Methodology

1. Lectures, problem solving and case studies
2. Case-based learning
3. Presentation and oral exposition of developed research
4. Participation in complementary activities
5. Field trips

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Complementary activities	26	1.04	11
Field trips	80	3.2	3, 2, 8, 4, 11
Final work	65	2.6	10, 2, 6, 11
Lessons	84	3.36	3, 2, 6, 11
Type: Supervised			
Reading papers	40	1.6	10, 11
Reading teaching materials	45	1.8	

Evaluation

FIRST SEMESTER

FIRST PART: THE METABOLIC PATTERN OF SOCIAL-ECOLOGICAL SYSTEMS: A tool for structuring perceptions and representations of sustainability **Prof: Mario Giampietro**

Assignment: The assignment will be provided and explained during the first class

SECOND PART: INTEGRATIVE EVALUATION APPROACHES & SOCIAL MULTI-CRITERIA EVALUATION
Prof: Neus Martí Sanz

Assignment: The assignment will be provided and explained during the first class

THIRD PART: VISIT TO THE ALINYÀ CAMPUS **Prof: Jordina Belmonte & Marti Boada**

Students will follow an evaluation consisting in answering the questions and field exercises that the teachers will provide dealing on the teachings received during the Alinyà trip; they can include personal opinions on how

to run the management of an environment. Students will have an accorded period of time for preparing and submitting the answers. They will be evaluated from 0 to 10 and the final mark will be the mean of the two (or more) exercises proposed.

FOURTH PART: URBAN PROCESSES Prof. Carme Miralles

Assignment: The assignment will be provided and explained during the first class

SECOND SEMESTER

COMMUNICATION AND ACADEMIC DIFFUSION, ALSO RELATED TO THE MASTER'S THESIS Prof. Antònia Casellas

Final Grade of the 8 Sessions: Essay Assignments (70%), Class Presentation (20%), Attendance & class participation (10%)

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Assistance activities and complementary field work	10	20	0.8	10, 3, 2, 7, 8, 5, 9, 6, 11
Attendance and active participation in class	10	5	0.2	1, 2, 8, 5, 9, 6, 4, 11
Defense course assignments	20	10	0.4	2, 11

Bibliography

FIRST SEMESTER

FIRST PART: THE METABOLIC PATTERN OF SOCIAL-ECOLOGICAL SYSTEMS. Prof: Mario Giampietro

- Giampietro, M., Aspinall, R.J., Ramos-Martin, J. and Bukkens, S.G.F. (Eds.) 2014. Resource Accounting for Sustainability Assessment: The Nexus between Energy, Food, Water and Land use. Routledge, 250 pp. (Chapters 7, 8, 9, 12, 13)

- Saltelli A. & Giampietro M. 2017. What is wrong with evidence based policy, and how can it be improved? Futures, <http://dx.doi.org/10.1016/j.futures.2016.11.012>

- Saltelli A., Giampietro M. & Gomiero T. 2017. Forcing consensus is bad for science and society, [The Conversation](#) (UK), 12 May 2017.

- Kovacic Z. and Giampietro M. 2015. Beyond "beyond GDP indicators:"The need for reflexivity in science for governance. Ecological Complexity 21: 53-61. <http://www.sciencedirect.com/science/article/pii/S1476945X14001494>

- Kovacic Z. & Giampietro M. 2017. Between theory and quantification: An integrated analysis of metabolic patterns of informal urban settlements, Energy Policy 100: 377-386.

- Kovacic Z., Smit S., Musango J.K., Brent A.C. and Giampietro M. 2016. Probing uncertainty levels of electrification in informal urban settlements: A case from South Africa. Habitat International, 56: 212-221.

- Chifari R, Renner A, Lo Piano S, Ripa M, Bukkens SGF & Giampietro M 2017. Development of a municipal solid waste management decision support tool for Naples, Italy. Journal of Cleaner Production, doi: [10.1016/j.jclepro.2017.06.074](https://doi.org/10.1016/j.jclepro.2017.06.074).

- Serrano-Tovar T. and Giampietro M. 2014. Multi-scale integrated analysis of rural Laos: Studying metabolic patterns of land uses across different levels and scales. Land Use Policy 36: 155-170.
<http://www.sciencedirect.com/science/article/pii/S0264837713001506>

SECOND PART: INTEGRATIVE EVALUATION APPROACHES & SOCIAL MULTI-CRITERIA EVALUATION
Prof: Neus Martí Sanz

- Munda G. 2008. Social multi-criteria evaluation for a sustainable economy, Operation Research and Decision Theory Series, Springer, Heidelberg, New York.

Further readings will be provided during the course.

THIRD PART: VISIT TO THE ALINYÀ CAMPUS Prof: Jordina Belmonte & Marti Boada

- AVV. Els sistemes naturals de la Vall d'Alinyà. Institució Catalana d'Història Natural i Fundació Territori i Paisatge. http://ichn.iec.cat/Alinya_Articles.htm

FOURTH PART: URBAN SYSTEMS

Congress conferences

SECOND SEMESTER

COMMUNICATION AND ACADEMIC DIFFUSION, ALSO RELATED TO THE MASTER'S THESIS. Prof. Antònia Casellas

- Feak C. & Swales J. (2009). Telling a Research Story: Writing a Literature Review. Ann Arbor, MI: University of Michigan Press.
- Holliday A. (2007). Doing and Writing Qualitative Research. London: Sage.
- Swales J. & Feak C. (2012). Academic Writing for Graduate Students: Essential Tasks and Skill. 3rd edition. University of Michigan Press.
- Waller, V., Farquharson, K, & Dempsey D. Eds (2016). Qualitative social research: contemporary methods for the digital age. Los Angeles, Calif: Sage.