

## Sustainable Management of Natural Resources

### Educational subject description sheet

#### Basic information

<p><b>Field of study</b> Joint Bachelor in Sustainability</p> <p><b>Speciality</b> Environmental &amp; Life Sciences</p> <p><b>Organizational unit</b> Faculty of Law and Administration</p> <p><b>Study level</b> first cycle (joint degree programme)</p> <p><b>Study form</b> full-time degree programme</p> <p><b>Education profile</b> General academic</p> <p><b>Mandatory</b> obligatory</p>		<p><b>Education cycle</b> 2025/26</p> <p><b>Subject code</b> UJ.WPAJBSELSS.8100.16550.25</p> <p><b>Lecture languages</b> english</p> <p><b>Subject related to scientific research</b> Yes</p> <p><b>Disciplines</b> Earth sciences and the environment, Management science and quality</p> <p><b>ISCED classification</b> 0521 Environmental sciences</p> <p><b>USOS code</b></p>	
<b>Subject coordinator</b>	Piotr Szwedo		
<b>Lecturer</b>	Rut Sanchez de Dios, Alejandro Rescia, Małgorzata Grodzińska-Jurczak, Joanna Tusznió, Erik Andersson		
<b>Period</b> Semester 5	<b>Examination</b> exam	<b>Activities and hours</b> Discussion class: 45	<b>Number of ECTS points</b> 5.0

#### Goals

C1	Knowledge and understanding: a) The ecological bases of natural resource management; b) The importance of environmental problems in today's society; c) The importance of correctly characterising these problems through scientific knowledge; d) The importance of correctly approaching their solution; e) The importance of identifying ecological processes underlying environmental problems; f) The complexity and transdisciplinarity of human land-use systems; g) The importance of ecological knowledge in professional practice; h) The usefulness of numerical models in environmental management.
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## Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
<b>Knowledge - Student knows and understands:</b>			
W1	determinants of the tragedy of the commons and theory of institutions and Elinor Ostrom's institutions for collective action.	JBS_K1_W03, JBS_K1_W05, JBS_K1_W06, JBS_K1_W07	written exam, oral exam
W2	the legislative framework for the protection and conservation of European Biodiversity.	JBS_K1_W05	written exam, oral exam
W3	the concepts of biodiversity and biological diversity and application to conservation.	JBS_K1_W06	written exam, oral exam
W4	the sustainability-related problems with different types of habitats.	JBS_K1_W04	written exam, oral exam
W5	the statistics on world population and world food production and distribution.	JBS_K1_W04, JBS_K1_W05	written exam, oral exam
W6	the ecological science applied to traditional farming systems.	JBS_K1_W06	written exam, oral exam
W7	the farming systems as complex adaptive systems.	JBS_K1_W06, JBS_K1_W07	written exam, oral exam
W8	the problems linked to the ecological and geological processes of water and environmental issues linked to the use of water	JBS_K1_W06	written exam, oral exam
W9	the radiation processes, factors affecting the solar radiation and energy balance on Earth.	JBS_K1_W07	written exam, oral exam
W10	the statistics on world fisheries, ecology of marine ecosystems and their naturalistic and environmental values.	JBS_K1_W04, JBS_K1_W05	written exam, oral exam
W11	the current trends in global urbanization especially sustainability challenges in densely populated areas.	JBS_K1_W03, JBS_K1_W04	written exam, oral exam
W12	the concept of city as a social-ecological-technological system and the theories and methods from systems thinking.	JBS_K1_W06, JBS_K1_W07	written exam, oral exam
<b>Skills - Student can:</b>			
U1	can design principles of institutions for collective action for solving problems in management of natural resources.	JBS_K1_U04	written exam, oral exam
U2	apply different measurement indices of alpha and beta diversity.	JBS_K1_U03	written exam, oral exam
U3	recommend technical solutions to increase agrarian production.	JBS_K1_U02	written exam, oral exam
U4	recommend management of agrarian systems.	JBS_K1_U03	written exam, oral exam
U5	determine an adaptive management of farming systems as social-ecological systems.	JBS_K1_U02	written exam, oral exam
U6	calculate the structural and functional characteristics of productive landscapes (landscape metrics).	JBS_K1_U02	written exam, oral exam
U7	assess the ecological factors related to overfishing.	JBS_K1_U03	written exam, oral exam

Code	Outcomes in terms of	Effects	Examination methods
U8	introduce the current mining industry, including its objectives, functions, and socio-economic importance.	JBS_K1_U02	written exam, oral exam
<b>Social competences - Student is ready for:</b>			
K1	to be aware of obstacles and opportunities in collective action for sustainable use of natural resources.	JBS_K1_K03	written exam, oral exam
K2	to cooperate for sustainable use of natural resources; the student can critically analyse problems in the governance of global commons.	JBS_K1_K02	written exam, oral exam
K3	to consider biodiversity as an economic resource.	JBS_K1_K03	written exam, oral exam
K4	valuing and raising awareness of social perception of biodiversity conservation.	JBS_K1_K03	written exam, oral exam
K5	to understand the traditional ecological knowledge (TEK) applied to traditional farming systems.	JBS_K1_K01	written exam, oral exam
K6	to demonstrate the multifunctionality of productive landscapes.	JBS_K1_K05	written exam, oral exam
K7	to understand the energy consumption issues, environmental problems and reserves of current and potential energy sources.	JBS_K1_K03	written exam, oral exam
K8	to provide scientific and economic tools for sustainable fisheries management.	JBS_K1_K04, JBS_K1_K05	written exam, oral exam
K9	to understand socio-economic factors related to overfishing.	JBS_K1_K03	written exam, oral exam
K10	to recognize different types of mineral deposits, their classification and formation of deposits.	JBS_K1_K03	written exam, oral exam
K11	to discuss the strategies in sustainable management of mineral resources and their impact on society and the environment and analyse the responses of institutions and industry to mining sustainability demand.	JBS_K1_K04, JBS_K1_K05	written exam, oral exam

### Calculation of ECTS points

Activity form	Activity hours*
Discussion class	45
problem analysis	45
preparation for the exam	35
preparation for classes	25
<b>Student workload</b>	<b>Hours</b> 150
	<b>ECTS</b> 5.0

\* hour means 45 minutes

## Study content

No.	Course content	Subject's learning outcomes
1.	<p>Principles of sustainable management - introduction, overview of challenges in management of various natural resources,</p> <ul style="list-style-type: none"> <li>• Definition of institutions, examples of institutions for managing natural resources</li> <li>• Tragedy of the commons</li> <li>• Institutions for collective action</li> <li>• Adaptive management</li> </ul>	W1, U1, K1
2.	<p>Principles of sustainable management - exercising institutions for collective action</p> <ul style="list-style-type: none"> <li>• Development and challenges of global and local institutions</li> </ul>	K2
3.	<p>Sustainable management of biodiversity</p> <ul style="list-style-type: none"> <li>• Principles of sustainable management of biodiversity in EU policy</li> <li>• Overview of EU documents and policies</li> <li>• Legal framework of the EU policy</li> <li>• Protected areas in the EU</li> </ul>	W2
4.	<p>Knowledge and conservation of biodiversity</p> <ul style="list-style-type: none"> <li>• Concept of biodiversity and biological diversity</li> <li>• Biodiversity as a resource</li> <li>• Alpha and Beta diversity. Indices for its measurement</li> <li>• Response to exploitation gradients and prospects for its conservation</li> </ul>	W3, U2, K3, K4
5.	<p>Sustainable management of biodiversity</p> <ul style="list-style-type: none"> <li>• Introduction to European biodiversity and conservation: Diversity of European habitat types</li> <li>• Habitat Restoration and the EU Habitat Action plan</li> </ul>	K2
6.	<p>Sustainable forestry</p> <ul style="list-style-type: none"> <li>• Introduction to forestry</li> <li>• Basics of forestry</li> </ul>	U1

No.	Course content	Subject's learning outcomes
7.	Sustainable forestry <ul style="list-style-type: none"> <li>• Silvicultural management, forest monitoring and forest conservation</li> </ul>	W3, U1
8.	Scrub management <ul style="list-style-type: none"> <li>• Introduction. Conservation and historic values of scrubs</li> <li>• Management planning and techniques</li> </ul>	W4, U1
9.	Agriculture, food, and environment <ul style="list-style-type: none"> <li>• Agricultural statistics</li> <li>• Agricultural models and human nutrition</li> <li>• Intensive vs. extensive systems</li> </ul>	W5, W6, U3, U4, K5
10.	Traditional agrarian systems as complex adaptive landscapes <ul style="list-style-type: none"> <li>• Systems thinking and tools</li> <li>• Rural cultural landscapes</li> <li>• Multifunctionality (multiple landscape services) and high natural values (HNV)</li> <li>• Mosaic structure and connectivity (spatial heterogeneity)</li> <li>• (pastoral systems (dehesas and mountain livestock), historical woody crops (olive groves))</li> </ul>	W7, U5, U6, K6
11.	Water and Energy as resources <ul style="list-style-type: none"> <li>• The hydrological cycle. Characterization and variability of water supply</li> <li>• Water demands and human modifications of the hydrological cycle</li> <li>• Ecological basis for an integrated water use policy</li> <li>• Solar radiation and radiation balance</li> <li>• Exo and endosomatic energy</li> <li>• Consumption of energy: economy, politics and environment</li> </ul>	W8, W9, K7

No.	Course content	Subject's learning outcomes
12.	Sustainable fisheries management <ul style="list-style-type: none"> <li>• Statistics of fisheries</li> <li>• Marine ecosystem and biological production</li> <li>• Naturalistic values, resources, and environmental values (ecosystem services)</li> <li>• Maximum Biological Sustainable Yield (MBSY) and Maximum Economic</li> <li>• Sustainable Yield (MESY)</li> <li>• Overfishing: ecological and socio-economic factors involved</li> </ul>	W10, U7, K8, K9
13.	Cities and urban systems <ul style="list-style-type: none"> <li>• Urbanised planet</li> <li>• Urban ecosystems</li> <li>• Resilient cities: human health and well-being</li> <li>• Mosaic governance, stewardship, and actor roles</li> </ul>	W11, W12
14.	Sustainable management of mineral resources (1) <ul style="list-style-type: none"> <li>• Metals and Society. Role of minerals in clean energy transition</li> <li>• Critical raw minerals. Assessment of criticality of raw materials</li> <li>• Ore deposits: a brief introduction</li> </ul>	U8, K10
15.	Sustainable management of mineral resources (2) <ul style="list-style-type: none"> <li>• Impacts of mining on society and environment</li> <li>• Responses of government and industry to the mining sustainability</li> <li>• Environmental management in mining: social and cultural issues, best practices, and strategies</li> </ul>	K11

### Course advanced

#### Teaching methods :

text analysis, conversation lecture, lecture with multimedia presentation, discussion, case study, gamification

Activities	Examination methods	Credit conditions
Discussion class	written exam, oral exam	Active participation (non-graded), oral and written exams (graded)

## Entry requirements

None

### Literature

#### Obligatory

1. Berkes, F., Folke, C. and Colding, J. (Eds.). 2000 Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience. Cambridge University Press, New York.
2. Gunderson, L.H. and Holling, C.S. (Eds.) 2002. Panarchy: Understanding Transformations in Human and Natural Systems. Washington, DC. Island Press.
3. McNeill, J. R. 2001. Something new under the sun: An environmental history of the twentieth-century world (the global century series). WW Norton & Company.
4. McPhearson, T., Kabisch, N. and Frantzeskaki, N. (Eds.). 2023. Nature-Based Solutions for Cities. eISBN: 9781800376762, the digital version is freely available online.
5. Ostrom, E. 2015, Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press.
6. Weinstein, M.P. and Turner, R.E. (Eds.). 2012. Sustainability Science. The Emerging Paradigm and the Urban Environment. Springer-Verlag, New York.

## Effects

Code	Content
JBS_K1_K01	The graduate can encourage sustainability-driven practices in the workplace and appraise sustainability of own values, perceptions, roles, and actions, with a special focus on environmental wellbeing.
JBS_K1_K02	The graduate can demonstrate considerable entrepreneurial initiative, autonomy, and readiness to act in complex and changing environments, especially in the context of supporting, undertaking, and co-organising activities beneficial for a sustainable society.
JBS_K1_K03	The graduate can consider different visions of the future and develop own evidence-based opinions in reference to the balance of values linked to economic development, social welfare, and environmental protection.
JBS_K1_K04	The graduate can critically assess and verbalize own competencies and skills related to different aspects of sustainability as well as their need for development.
JBS_K1_K05	The graduate can defend the importance of scientific data and methods as a basis for decision-making.
JBS_K1_U02	The graduate can present and report knowledge, methodologies, ideas, problems and solutions, clearly and comprehensively, in different forms destined for different audiences – including discussions and debates which require defending a substantiated opinion, as well as conversations in a foreign language at the CEFR B2 level.
JBS_K1_U03	The graduate can apply adequate methods and tools, including selected IT tools, to solve problems related to data collection, analysis, and management in the context of sustainability.
JBS_K1_U04	The graduate can plan and effectuate simple sustainability-related projects under supervision and in the context of personal lifelong learning, both individually and in a team, using appropriate transversal skills and taking shared responsibility for the outcome.
JBS_K1_W03	The graduate can give examples of sustainability-related dilemmas and hypothesize on the optimal course of action.
JBS_K1_W04	The graduate can identify sustainability-related problems specific to selected cultural, geographical, and political contexts.
JBS_K1_W05	The graduate can identify essential international instruments and institutions related to sustainability and explain their potential role in resolution of a given problem.
JBS_K1_W06	The graduate can describe interconnections between various aspects of sustainability and identify their significance in the context of natural and social sciences, with a special focus on disciplines included in the selected specialisation track (law and politics; chemistry and physics; chemistry and biology; economics and geography; economics, management and engineering; humanities).
JBS_K1_W07	The graduate can apply the theory and methodology of disciplines included in the selected specialisation track to sustainability-related problems, taking into consideration practical limitations such as protection of intellectual property.