

Module

Tutors	Prof. Ifigeneia Kagkalou
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- GENERAL**

Title of Module	Water Resilience Strategy		
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units	
Lecture	2	0.1167	
Language of Tutoring and Examination:	English		

- EDUCATIONAL OBJECTIVES**

Educational Objectives The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.
The acquired specific knowledge will be cover: the exploitation of the value of water, the need for fostering water efficient technologies, the water allocation between sectors with emphasis on the WEFE nexus, the need for ensuring the zero pollution agenda and the biodiversity strategy and finally the way towards achievement of the SDGs agenda.
General Skills <i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i> <i>Research, analysis, and synthesis of data and information, using the necessary technologies</i> <i>Adaptation to new situations</i> <i>Decision making</i> <i>Independent work</i> <i>Teamwork</i> <i>Working in an international environment</i> <i>Working in an interdisciplinary environment</i> <i>Generating new research ideas</i> <i>Project planning and management</i> <i>Respect for diversity and multiculturalism</i> <i>Respect for the natural environment</i> <i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i> <i>Exercise of critical and self-critical thinking</i> <i>Promotion of free, creative, and inductive thinking</i>
<ul style="list-style-type: none"> • Adaptation to new situations • Decision making • Working in an international environment • Working in an interdisciplinary environment • Generating new research ideas • Project planning and management

- MODULE CONTENT**

<ul style="list-style-type: none"> • Introduction to water security • Water related priorities • Water efficiency, scarcity, pollution • Human communities and aquatic ecosystems • The EU Water Resilience Strategy

- TEACHING and LEARNING METHODS - ASSESSMENT**

Training Method <i>Physical presence/on-line /blended.</i>	Physical presence
Use Of Information And Communication Technologies (Ict)	Use of ppt presentations

<p><i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i></p>	
<p>Evaluation Of Trainees <i>Description of the evaluation process</i></p> <p><i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i></p> <p><i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i></p>	<p>Evaluation Language: English Evaluation Methods: Public Presentation of a scientific article. Evaluation on the understanding of the concept, summarizing the state of the art, presentation of the key-issues.</p>

● **RECOMMENDED BIBLIOGRAPHY**

<ul style="list-style-type: none"> ● EEA Report (2025). Europe’s environment and climate: knowledge for resilience, prosperity and sustainability. ISBN 978-92-9480-731-1 ● JRC, et al., 2025, Earth System Tipping Points are a threat to Europe, Science for Policy Report No 140827 (https://publications.jrc.ec.europa.eu/repository/handle/JRC140827) ● IPBES, 2024, Summary for policymakers of the thematic assessment of the interlinkages among biodiversity, water, food and health (nexus assessment).
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Module

Tutors	Prof. Spyridon Ntougias
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- GENERAL**

Title of Module	Integrated Approaches at Local Scale for Enhancing Water Reuse Efficiency and Sustainable Soil Fertilization from Wastewater's Recovered Nutrients		
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units	
Lecture	2	0.1167	
Language of Tutoring and Examination:	English		

- EDUCATIONAL OBJECTIVES**

Educational Objectives The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.
Upon successful completion of this thematic unit, learners will be able to: <ul style="list-style-type: none"> • Explain the principles of circular water management and the role of wastewater treatment and reuse in addressing water scarcity and promoting sustainable resource management. • Describe integrated wastewater treatment approaches, including nature-based solutions such as constructed wetlands and advanced treatment technologies used to improve water quality for safe reuse. • Identify the processes and technologies for nutrient recovery from wastewater and biomass, and explain how these recovered nutrients can be transformed into sustainable fertilizers. • Evaluate the environmental and agricultural benefits of wastewater reuse, including improved soil fertility, reduced dependence on synthetic fertilizers, and enhanced water-use efficiency in agriculture. • Assess the risks and quality requirements associated with reclaimed water use, including monitoring, treatment performance, and compliance with environmental and health regulations. • Apply circular economy principles to local water–soil systems, integrating water reuse, nutrient recovery, and sustainable agricultural practices. • Analyze case studies and practical applications of local-scale water reuse systems, with emphasis on decentralized treatment and community-level solutions.
General Skills <i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i> <i>Research, analysis, and synthesis of data and information, using the necessary technologies</i> <i>Adaptation to new situations</i> <i>Decision making</i> <i>Independent work</i> <i>Teamwork</i> <i>Working in an international environment</i> <i>Working in an interdisciplinary environment</i> <i>Generating new research ideas</i> <i>Project planning and management</i> <i>Respect for diversity and multiculturalism</i> <i>Respect for the natural environment</i> <i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i> <i>Exercise of critical and self-critical thinking</i> <i>Promotion of free, creative, and inductive thinking</i>
<ul style="list-style-type: none"> • Research, analysis, and synthesis of data and information, using the necessary technologies • Adaptation to new situations • Working in an international environment • Working in an interdisciplinary environment

- Respect for the natural environment
- Promotion of free, creative, and inductive thinking

• MODULE CONTENT

The module “Integrated Approaches at Local Scale for Enhancing Water Reuse Efficiency and Sustainable Soil Fertilization from Wastewater’s Recovered Nutrients” introduces learners to circular approaches for managing water and nutrients in agriculture. It focuses on innovative nature-based wastewater treatment solutions that enable safe water reuse and nutrient recovery. The module presents technologies such as constructed wetlands, advanced filtration systems, and monitoring tools that improve treatment efficiency and environmental safety. It also explains how nutrients recovered from wastewater and biomass can be converted into sustainable fertilizers that enhance soil fertility and reduce reliance on synthetic chemicals. Emphasis is placed on local-scale implementation, environmental protection, and efficient irrigation practices. Case studies and practical examples from the CIRQUA Project (<https://cirqua-water.eu/>) demonstrate how integrated systems can support sustainable agriculture, resource efficiency, and circular economy principles in water and soil management.

• TEACHING and LEARNING METHODS - ASSESSMENT

Training Method <i>Physical presence/on-line /blended.</i>	Physical Presence
Use Of Information And Communication Technologies (Ict) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i>	Use of ppt presentations. Scopus web platform.
Evaluation Of Trainees <i>Description of the evaluation process</i> <i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i> <i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i>	Evaluation Language: English Evaluation Methods: Public Presentation of a scientific article. Evaluation on the understanding of the concept, summarizing the state of the art, presentation of the key-issues.

• RECOMMENDED BIBLIOGRAPHY

- Frontiers in Sustainability Journal, Nature-Based Solutions section, Specialty Chief Editors: Cristina Sousa Coutinho Calheiros and Spyridon Ntougias
- Fam, D. M., Mitchell, C. A. (2013). Sustainable innovation in wastewater management: lessons for nutrient recovery and reuse. *Local Environment*, 18(7), 769-780.
- Saliu, T. D., Oladoja, N. A. (2021). Nutrient recovery from wastewater and reuse in agriculture: a review. *Environmental Chemistry Letters*, 19(3), 2299-2316.

Module

Tutors	Prof. Georgios Sylaios
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- GENERAL**

Title of Module	Ecohydrology and Nature-based solutions to address climate change challenges		
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units	
Lecture	2	0.1167	
Language of Tutoring and Examination:	English		

- EDUCATIONAL OBJECTIVES**

<p>Educational Objectives</p> <p>The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.</p>
<ul style="list-style-type: none"> Introducing students to the principles of ecohydrology Assess climate change challenges using metrics and indicators Discuss available Nature-based Solutions to address each CC challenge
<p>General Skills</p> <p><i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i></p> <p>Research, analysis, and synthesis of data and information, using the necessary technologies</p> <p>Adaptation to new situations</p> <p>Decision making</p> <p>Independent work</p> <p>Teamwork</p> <p>Working in an international environment</p> <p>Working in an interdisciplinary environment</p> <p>Generating new research ideas</p> <p>Project planning and management</p> <p>Respect for diversity and multiculturalism</p> <p>Respect for the natural environment</p> <p>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</p> <p>Exercise of critical and self-critical thinking</p> <p>Promotion of free, creative, and inductive thinking</p>
<ul style="list-style-type: none"> Research, analysis, and synthesis of data and information, using the necessary technologies Generating new research ideas

- MODULE CONTENT**

<ul style="list-style-type: none"> Definition of ecohydrology Basic principles and rules for an ecohydrology approach to water management Historic meteorological data and climate change scenarios Climate change indicators Proposed Nature-based Solutions per CC challenge

- TEACHING and LEARNING METHODS - ASSESSMENT**

Training Method <i>Physical presence/on-line /blended.</i>	Physical presence
Use Of Information And Communication Technologies (Ict) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i>	Programming in R

<p>Evaluation Of Trainees <i>Description of the evaluation process</i></p> <p><i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i></p> <p><i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i></p>	<p>Evaluation Language: English Evaluation Methods: Multiple Choice Test</p>
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● **RECOMMENDED BIBLIOGRAPHY**

<ul style="list-style-type: none"> ● Zalewski, M., et al., 2021. Ecohydrology and adaptation to global change. <i>Ecohydrology & Hydrobiology</i>, 21, 3, 393-410, https://doi.org/10.1016/j.ecohyd.2021.08.001. ● Zalewski, M., 2000. Ecohydrology — the scientific background to use ecosystem properties as management tools toward sustainability of water resources. <i>Ecological Engineering</i>, 16, 1, 1-8, https://doi.org/10.1016/S0925-8574(00)00071-9. ● Boskidis, I., Kokkos, N., Sapounidis, A., Triantafillidis, S., Koutrakis, E., Sylaios, G., 2018. Ecohydraulic modeling of Nestos River delta under low flow regimes. <i>Ecohydrology and Hydrobiology</i> 18, 391-400, https://doi.org/10.1016/j.ecohyd.2018.06.004. ● Seddon, N., Chausson, A., Berry, P., Girardin, C.A.J., Smith, A., Turner, P., 2020. Understanding the value and limits of nature-based solutions to climate change and other global challenges. <i>Philos Trans R Soc Lond B Biol Sci</i>, 375, 1794, 20190120. https://doi.org/10.1098/rstb.2019.0120. ● Seddon, N., Smith, A., Smith, P., Key, I., Chausson, A., Girardin, C., House, J., Srivastava, S., Turner, B., 2021. Getting the message right on nature-based solutions to climate change. <i>Glob. Change Biol.</i>, 27: 1518 - 1546. https://doi.org/10.1111/gcb.15513

Module

Tutors	Prof. Christos Akratos
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- GENERAL**

Title of Module	Constructed Wetlands for wastewater and runoff treatment		
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units	
Lecture	2	0.1167	
Language of Tutoring and Examination:	English		

- EDUCATIONAL OBJECTIVES**

<p>Educational Objectives</p> <p>The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.</p>
<p>By the end of the course, participants will be able to:</p> <ul style="list-style-type: none"> • Understand the ecological and biogeochemical processes governing treatment in constructed wetlands • Identify different types of constructed wetlands and their appropriate applications • Apply basic design principles for wastewater and stormwater treatment wetlands • Evaluate treatment performance and operational considerations • Integrate constructed wetlands into watershed management and circular water systems • Assess environmental, economic, and social aspects of nature-based wastewater treatment solutions
<p>General Skills</p> <p><i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i></p> <p><i>Research, analysis, and synthesis of data and information, using the necessary technologies</i></p> <p><i>Adaptation to new situations</i></p> <p><i>Decision making</i></p> <p><i>Independent work</i></p> <p><i>Teamwork</i></p> <p><i>Working in an international environment</i></p> <p><i>Working in an interdisciplinary environment</i></p> <p><i>Generating new research ideas</i></p> <p><i>Project planning and management</i></p> <p><i>Respect for diversity and multiculturalism</i></p> <p><i>Respect for the natural environment</i></p> <p><i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i></p> <p><i>Exercise of critical and self-critical thinking</i></p> <p><i>Promotion of free, creative, and inductive thinking</i></p>
<ul style="list-style-type: none"> • Research, analysis, and synthesis of data and information, using the necessary technologies • Teamwork • Working in an international environment • Working in an interdisciplinary environment • Generating new research ideas • Project planning and management • Respect for the natural environment • Exercise of critical and self-critical thinking

- MODULE CONTENT**

<ul style="list-style-type: none"> • Introduction to Nature-Based Wastewater Treatment • Wetland Ecology and Treatment Processes • Types of Constructed Wetlands • Design Principles and Engineering
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- Treatment of Urban Runoff and Agricultural Drainage
- Operation, Maintenance, and Monitoring
- Modeling and Performance Assessment
- Case Studies and Global Applications

• **TEACHING and LEARNING METHODS - ASSESSMENT**

<p>Training Method <i>Physical presence/on-line /blended.</i></p>	Physical Presence
<p>Use Of Information And Communication Technologies (Ict) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i></p>	Use of ICT in Teaching
<p>Evaluation Of Trainees <i>Description of the evaluation process</i></p> <p><i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i></p> <p><i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i></p>	Evaluation Language: English Evaluation Methods: Report

• **RECOMMENDED BIBLIOGRAPHY**

- Kadlec, R. H., Wallace, S. (2008). Treatment wetlands. CRC press.
- Akrotos, C. S., Tsihrintzis, V. A. (2007). Effect of temperature, HRT, vegetation and porous media on removal efficiency of pilot-scale horizontal subsurface flow constructed wetlands. *Ecological engineering*, 29(2), 173-191.
- Akrotos, C. S., Tatoulis, T. I., Tekerlekopoulou, A. G. (2020). Biotreatment of winery wastewater using a hybrid system combining biological trickling filters and constructed wetlands. *Applied Sciences*, 10(2), 619.

Module

Tutors	Prof. Melidis Paraschos
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- GENERAL**

Title of Module	Sustainable municipal wastewater treatment and EU compliance: The role of anaerobic membrane bioreactors		
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units	
Lecture	2	0.1167	
Language of Tutoring and Examination:	English		

- EDUCATIONAL OBJECTIVES**

<p>Educational Objectives</p> <p>The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.</p>
<p>Understanding anaerobic kinetics, membrane filtration principles (UF/MF), and reactor design</p> <p>Mastering strategies to monitor, prevent, and treat membrane fouling</p> <p>The 2024 UWWTD revisions and the EU 2020/741 Regulation</p> <p>Exploring techniques for nutrient recovery (N & P) and turning waste streams into high-value bio-resources</p> <p>Evaluating carbon footprints and developing methods to capture dissolved methane to prevent fugitive GHG emissions</p>
<p>General Skills</p> <p><i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i></p> <p><i>Research, analysis, and synthesis of data and information, using the necessary technologies</i></p> <p><i>Adaptation to new situations</i></p> <p><i>Decision making</i></p> <p><i>Independent work</i></p> <p><i>Teamwork</i></p> <p><i>Working in an international environment</i></p> <p><i>Working in an interdisciplinary environment</i></p> <p><i>Generating new research ideas</i></p> <p><i>Project planning and management</i></p> <p><i>Respect for diversity and multiculturalism</i></p> <p><i>Respect for the natural environment</i></p> <p><i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i></p> <p><i>Exercise of critical and self-critical thinking</i></p> <p><i>Promotion of free, creative, and inductive thinking</i></p>
<p>Decision making</p> <p>Independent work</p> <p>Teamwork</p> <p>Working in an international environment</p> <p>Working in an interdisciplinary environment</p>

- MODULE CONTENT**

Key Learning Points

- The 2024/2025 UWWTD Revision: Why energy neutrality by 2040 and strict water reuse standards (EU 2020/741) make conventional systems obsolete.

- AnMBR Fundamentals: Anaerobic digestion + Membrane filtration. The shift from energy-consuming aeration to energy-producing methanogenesis.
- Membrane Fouling: Physics of clogging, "Critical Flux" concept, and maintenance strategies (gas sparging vs. chemical cleaning).
- Resource Recovery: Turning effluent into "Class A" irrigation water and capturing dissolved methane to prevent GHG emissions.
- Economics considerations: High initial cost of membranes vs. long-term savings in energy and sludge disposal.
- Is your local municipality ready for an AnMBR retrofit?

• **TEACHING and LEARNING METHODS - ASSESSMENT**

Training Method <i>Physical presence/on-line /blended.</i>	Physical Presence
Use Of Information And Communication Technologies (Ict) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i>	Use of ICT in Teaching
Evaluation Of Trainees <i>Description of the evaluation process</i> <i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i> <i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i>	Evaluation Language: English Evaluation Methods: Written Assignment, Oral Examination, Public Presentation

• **RECOMMENDED BIBLIOGRAPHY**

- Directive (EU) 2024/3019 of the European Parliament and of the Council of 27 November 2024 concerning urban wastewater treatment (recast)
- Anaerobic Treatment of Domestic Wastewater Present Status and Potentialities, 2024 IWA
- Wastewater-engineering-treatment-and-resource-recovery-fifth-edition-6

Module

Tutors	Assistant Prof. Evangelia Kostenidou
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- GENERAL**

Title of Module	Climate in Transition: Regional Impacts, Ecosystem Shifts and Future Projections		
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units	
Lecture	2	0.1167	
Language of Tutoring and Examination:	English		

- EDUCATIONAL OBJECTIVES**

<p>Educational Objectives</p> <p>The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.</p>
<p>The aim of this module is to introduce participants to the scientific basis of climate change and its impacts on natural systems, ecosystems, and regional climates. The course will provide an overview of the key drivers of climate change, the mechanisms influencing regional climate variability, and the consequences for ecosystems, biodiversity, and environmental stability. Participants will also explore future climate projections and discuss possible pathways for adaptation and resilience.</p> <p>By the end of the module, participants will be able to:</p> <ul style="list-style-type: none"> • Understand the fundamental processes driving climate change. • Recognize the main regional manifestations of climate change. • Explain how climate change affects ecosystems and natural environments. • Interpret basic climate projections and environmental indicators. • Discuss potential strategies for climate adaptation and resilience.
<p>General Skills</p> <p><i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i></p> <p><i>Research, analysis, and synthesis of data and information, using the necessary technologies</i></p> <p><i>Adaptation to new situations</i></p> <p><i>Decision making</i></p> <p><i>Independent work</i></p> <p><i>Teamwork</i></p> <p><i>Working in an international environment</i></p> <p><i>Working in an interdisciplinary environment</i></p> <p><i>Generating new research ideas</i></p> <p><i>Project planning and management</i></p> <p><i>Respect for diversity and multiculturalism</i></p> <p><i>Respect for the natural environment</i></p> <p><i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i></p> <p><i>Exercise of critical and self-critical thinking</i></p> <p><i>Promotion of free, creative, and inductive thinking</i></p>
<ul style="list-style-type: none"> • Adaptation to new situations • Decision making • Autonomous work • Respect for the natural environment • Working in an international environment • Working in an interdisciplinary environment • Exercise of critical and self-critical thinking • Promotion of free, creative, and inductive thinking

● **MODULE CONTENT**

<p>1. Introduction to Climate Change: The climate system and its components; Greenhouse gases and radiative forcing; Anthropogenic vs. natural drivers of climate change</p> <p>2. Observed Climate Change: Global temperature trends; Changes in precipitation patterns; Extreme weather events</p> <p>3. Regional Climate Impacts: Climate variability across different regions; Impacts on Mediterranean and European ecosystems; Regional vulnerability and climate sensitivity</p> <p>4. Ecosystem Responses to Climate Change: Effects on biodiversity and ecosystem functioning; Shifts in species distribution; Impacts on forests, agriculture, and marine systems</p> <p>5. Future Climate Projections: Climate scenarios and projections; Expected environmental and socio-economic impacts; Climate tipping points and uncertainties</p> <p>6. Adaptation and Resilience: Nature-based solutions; Ecosystem-based adaptation; Sustainable environmental management</p>
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● **TEACHING and LEARNING METHODS - ASSESSMENT**

<p>Training Method <i>Physical presence/on-line /blended.</i></p>	Physical Presence
<p>Use Of Information And Communication Technologies (Ict) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i></p>	<ul style="list-style-type: none"> • PowerPoint presentations and visual climate data • Graphs and datasets illustrating climate trends and projections • Use of online climate resources and scientific databases • Short multimedia materials illustrating ecosystem impacts • Interactive discussion and analysis of climate maps and indicators
<p>Evaluation Of Trainees <i>Description of the evaluation process</i></p> <p><i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i></p> <p><i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i></p>	<p>Evaluation Language: English</p> <p>Evaluation Methods:</p> <ul style="list-style-type: none"> • Active participation in discussions during the session • Short interactive questions during the lecture • Group discussion on climate impacts and adaptation strategies

● **RECOMMENDED BIBLIOGRAPHY**

<ol style="list-style-type: none"> 1. IPCC. (2023). Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland: IPCC. 2. IPCC. (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. 3. Steffen, W., Rockström, J., Richardson, K., Lenton, T. M., Folke, C., Liverman, D., et al. (2018). Trajectories of the Earth System in the Anthropocene. <i>Proceedings of the National Academy of Sciences</i>, 115(33), 8252–8259. 4. Pecl, G. T., Araújo, M. B., Bell, J. D., Blanchard, J., Bonebrake, T. C., Chen, I.-C., et al. (2017). Biodiversity redistribution under climate change: Impacts on ecosystems and human well-being. <i>Science</i>, 355(6332), eaai9214. 5. Allen, M. R., Dube, O. P., Solecki, W., Aragón-Durand, F., Cramer, W., Humphreys, S., et al. (2018). Framing and Context. In: <i>Global Warming of 1.5°C – An IPCC Special Report</i>. Intergovernmental Panel on Climate Change. 6. Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., Lambin, E., et al. (2009). A safe operating space for humanity. <i>Nature</i>, 461, 472–475.
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Module

Tutors	Assistant Prof. Nikolaos Remmas
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- GENERAL**

Title of Module	Microbial Ecology in Wastewater Treatment Systems	
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units
Lecture	2	0.1167
Language of Tutoring and Examination:	English	

- EDUCATIONAL OBJECTIVES**

Educational Objectives The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.
Upon completion of this lecture, students will be able to understand aspects of the fundamental role of microorganisms in biological wastewater treatment processes. The course will introduce the main microbial groups involved in wastewater treatment systems (bacteria, archaea, protozoa) and their ecological interactions within activated sludge and other treatment processes. Students will gain a basic understanding of how microbial community structure influences key processes such as organic matter degradation, nitrification, denitrification, and phosphorus removal. Additionally, the lecture will highlight the importance of microbial ecology for the stability, efficiency, and monitoring of wastewater treatment systems.
General Skills <i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i> <i>Research, analysis, and synthesis of data and information, using the necessary technologies</i> <i>Adaptation to new situations</i> <i>Decision making</i> <i>Independent work</i> <i>Teamwork</i> <i>Working in an international environment</i> <i>Working in an interdisciplinary environment</i> <i>Generating new research ideas</i> <i>Project planning and management</i> <i>Respect for diversity and multiculturalism</i> <i>Respect for the natural environment</i> <i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i> <i>Exercise of critical and self-critical thinking</i> <i>Promotion of free, creative, and inductive thinking</i>
<ul style="list-style-type: none"> • Independent work • Teamwork • Respect for the natural environment • Exercise of critical and self-critical thinking • Promotion of free, creative, and inductive thinking

- MODULE CONTENT**

<ul style="list-style-type: none"> • Introduction to microbial ecology in wastewater treatment systems. • Overview of the main microbial groups present in biological treatment processes, including bacteria, archaea, protozoa, and filamentous microorganisms. • Role of microbial communities in key biological processes such as organic matter degradation, nitrification, denitrification, and biological phosphorus removal.

- Microbial interactions and their importance for the stability and performance of treatment systems, particularly activated sludge.
- Emphasis on the role of protozoa as bioindicators (biomarkers.)
- Introduction to basic methods used for the observation and evaluation of microbial communities in wastewater treatment.

• **TEACHING and LEARNING METHODS - ASSESSMENT**

Training Method <i>Physical presence/on-line /blended.</i>	Physical Presence
Use Of Information And Communication Technologies (Ict) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i>	ICT tools will support teaching through presentation software (PowerPoint), illustrating microbial processes and microscopy images of wastewater microorganisms.
Evaluation Of Trainees <i>Description of the evaluation process</i> <i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i> <i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i>	Evaluation Language: English Evaluation Methods: Formative. Formative assessment through discussion in-class, and questions evaluating the understanding of microbial processes in WWTPs.

• **RECOMMENDED BIBLIOGRAPHY**

- Kirchman, D. L. (2018). *Processes in Microbial Ecology*. Oxford University Press.
- Seviour, R., Nielsen, P. H. (Eds.) (2010). *Microbial Ecology of Activated Sludge*. IWA publishing.
- Nielsen, P. H., McMahon, K. D. (2014). Microbiology and microbial ecology of the activated sludge process. *Activated sludge–100 years and counting*, 53-76.

Module

Tutors	Dr. Ioannis Stavrakakis
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- GENERAL**

Title of Module	Bioengineering approaches for the reduction of excess sludge produced in wastewater treatment plants.		
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units	
Lecture	2	0.1167	
Language of Tutoring and Examination:	English		

- EDUCATIONAL OBJECTIVES**

Educational Objectives The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.
This module provides an intensive deep-dive into the biological and engineering strategies used to minimize the production of excess sludge, one of the most significant economic and environmental challenges in modern wastewater management. This includes methods to assess excess sludge like predation on bacteria, uncoupling metabolism, ozonation, sonication and proliferation on endogenous metabolism. In the frame of this module, learners will understand how the above can influence the reduction of excess sludge production.
General Skills <i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i> <i>Research, analysis, and synthesis of data and information, using the necessary technologies</i> <i>Adaptation to new situations</i> <i>Decision making</i> <i>Independent work</i> <i>Teamwork</i> <i>Working in an international environment</i> <i>Working in an interdisciplinary environment</i> <i>Generating new research ideas</i> <i>Project planning and management</i> <i>Respect for diversity and multiculturalism</i> <i>Respect for the natural environment</i> <i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i> <i>Exercise of critical and self-critical thinking</i> <i>Promotion of free, creative, and inductive thinking</i>
<ul style="list-style-type: none"> • Research, analysis, and synthesis of data and information, using the necessary technologies • Decision making • Independent work • Working in an interdisciplinary environment • Generating new research ideas • Project planning and management • Respect for the natural environment • Exercise of critical and self-critical thinking • Promotion of free, creative, and inductive thinking

- MODULE CONTENT**

This module explores biotechnological strategies to minimize excess sludge production at the source, moving beyond traditional disposal toward sustainable wastewater management. Participants will master biological reduction mechanisms, while evaluating advanced process configurations. By integrating microbiology with process engineering and life-cycle assessment, the course empowers learners to design resource-efficient treatment plants that align with circular economy principles.

• **TEACHING and LEARNING METHODS - ASSESSMENT**

<p style="text-align: center;">Training Method <i>Physical presence/on-line /blended.</i></p>	Physical Presence
<p style="text-align: center;">Use Of Information And Communication Technologies (Ict) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i></p>	Use of ICT in teaching (Projectors, slides, Internet access, online bibliographical database)
<p>Evaluation Of Trainees <i>Description of the evaluation process</i></p> <p><i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i></p> <p><i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i></p>	<p>Evaluation Language: English</p> <p>Evaluation Methods: Short Answer Questions</p>

• **RECOMMENDED BIBLIOGRAPHY**

<ul style="list-style-type: none"> • Henze, M., van Loosdrecht, M. C., Ekama, G. A., Brdjanovic, D. (Eds.). (2008). <i>Biological wastewater treatment</i>. IWA publishing. • Metcalf & Eddy, A. E. C. O. M. (2014). <i>Wastewater engineering treatment and resource recovery</i>. McGraw-Hill Education. • Chen, Y., Jiang, X., Yang, M., & Wang, Z. (2025). Biotechnology revival: in situ sludge minimization in wastewater. <i>Frontiers in Microbiology</i>, 16, 1603215.
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Module

Tutors	Dr. Dionissis Latinopoulos
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- GENERAL**

Title of Module	EU Policy for Nature Restoration	
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units
Lecture	2	0.1167
Language of Tutoring and Examination:	English	

- EDUCATIONAL OBJECTIVES**

Educational Objectives
The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.
<ul style="list-style-type: none"> Trace the evolution of EU environmental and restoration legislation since the 1990s Explain the key objectives and mechanisms of core directives (WFD, Habitats, Birds, Floods) Understand how Nature-Based Solutions (NBS) are embedded in EU policy frameworks Critically assess the 2024 Nature Restoration Regulation and its implications for water ecosystems
General Skills
<i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i>
<i>Research, analysis, and synthesis of data and information, using the necessary technologies</i>
<i>Adaptation to new situations</i>
<i>Decision making</i>
<i>Independent work</i>
<i>Teamwork</i>
<i>Working in an international environment</i>
<i>Working in an interdisciplinary environment</i>
<i>Generating new research ideas</i>
<i>Project planning and management</i>
<i>Respect for diversity and multiculturalism</i>
<i>Respect for the natural environment</i>
<i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i>
<i>Exercise of critical and self-critical thinking</i>
<i>Promotion of free, creative, and inductive thinking</i>
<ul style="list-style-type: none"> Research, analysis, and synthesis of data and information, using the necessary technologies - students must navigate and cross-reference multiple EU legal texts, EEA reports, and monitoring data Working in an international environment - EU policy by definition operates across 27 Member States; the entire module is framed around multi-country governance Working in an interdisciplinary environment - the module explicitly bridges ecology, hydrology, law, economics, and spatial planning Respect for the natural environment - this is arguably the raison of the module; restoration targets and NBS are framed around ecological value Exercise of critical and self-critical thinking - the discussion questions directly challenge students to interrogate policy trade-offs (WFD deadlines, NBS vs. hard infrastructure, food vs. restoration) Promotion of free, creative, and inductive thinking - BS by definition requires moving beyond conventional engineering solutions; students are pushed to think about co-benefits and integrated approaches

• **MODULE CONTENT**

- EU Legislation for Nature Restoration Timeline
- Key Directives demanding for Restoration measures Overview (WFD, Habitats, Birds, Floods)
- NBS Framework as “depicted” by the legislation tools
- Focus on the New Restoration Regulation
- Q&A

• **TEACHING and LEARNING METHODS - ASSESSMENT**

Training Method <i>Physical presence/on-line /blended.</i>	Physical Presence
Use Of Information And Communication Technologies (Ict) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i>	Yes, presentation software, EUR-Lex (EU legal database), WISE (online platform for water status)
Evaluation Of Trainees <i>Description of the evaluation process</i> <i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i> <i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i>	Evaluation Language: English Evaluation Methods: Critical Thinking Pop Quiz 8 x MCQ questions — covering one per major topic (Birds, Habitats, WFD, Floods, NBS, NRL targets, Article 7, ICT tools) — 5–6 minutes 2 x Short Answer questions — one asking for factual synthesis, one asking for a critical position — 8–9 minutes

• **RECOMMENDED BIBLIOGRAPHY**

Basic

- European Environment Agency (2023). The State of Nature in the EU. EEA Report No. 06/2023. Copenhagen: EEA.
- European Environment Agency (2022). European Waters: Assessment of Status and Pressures 2022. EEA Report No. 07/2022.
- European Commission (2020). EU Biodiversity Strategy for 2030: Bringing Nature Back into Our Lives. COM(2020) 380 final.
- European Commission (2021). EU Strategy on Adaptation to Climate Change. COM(2021) 82 final.
- European Commission (2022). Impact Assessment Accompanying the Nature Restoration Law Proposal. SWD(2022) 167 final. (essential for understanding the evidence base)
- WISE (Water Information System for Europe). River Basin Management Plans — country-specific documents available at wise.europa.eu
- European Commission (2021). Forging a Climate-Resilient Europe: the New EU Strategy on Adaptation.

Advanced

- Aronson, J. & Alexander, S. (2013). Ecosystem restoration is now a global priority: time to roll up our sleeves. *Restoration Ecology*, 21(3), 293–296.
- Boeuf, B. & Fritsch, O. (2016). Studying the implementation of the Water Framework Directive in Europe: a meta-analysis of 89 journal articles. *Ecology and Society*, 21(2), 19.
- Chausson, A. et al. (2020). Mapping the effectiveness of nature-based solutions for climate change adaptation. *Global Change Biology*, 26(11), 6134–6155
- Hermoso, V. et al. (2022). The EU Nature Restoration Law — an ambitious step towards reversing biodiversity loss. *Frontiers in Conservation Science*.

Module

Tutors	Dr. Nikolaos Kokkos
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- GENERAL**

Title of Module	Climatic databases and climatic indicators to address climate change		
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units	
Lecture	2	0.1167	
Language of Tutoring and Examination:	English		

- EDUCATIONAL OBJECTIVES**

<p>Educational Objectives</p> <p>The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.</p>
<p>Upon successful completion of this module, trainees will be able to:</p> <ul style="list-style-type: none"> • Understand the structure and types of major climatic databases used in climate research. • Identify and access global and regional climate datasets (e.g., temperature, precipitation, oceanographic and atmospheric data). • Understand the concept and applications of climate indicators used to monitor climate variability and climate change. • Analyze climatic data and derive basic climate indicators related to temperature trends, extreme events, and variability. • Interpret climate indicators to support climate change assessment and decision-making. • Become familiar with the use of digital tools and platforms for accessing and analyzing climate information.
<p>General Skills</p> <p><i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i></p> <p><i>Research, analysis, and synthesis of data and information, using the necessary technologies</i></p> <p><i>Adaptation to new situations</i></p> <p><i>Decision making</i></p> <p><i>Independent work</i></p> <p><i>Teamwork</i></p> <p><i>Working in an international environment</i></p> <p><i>Working in an interdisciplinary environment</i></p> <p><i>Generating new research ideas</i></p> <p><i>Project planning and management</i></p> <p><i>Respect for diversity and multiculturalism</i></p> <p><i>Respect for the natural environment</i></p> <p><i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i></p> <p><i>Exercise of critical and self-critical thinking</i></p> <p><i>Promotion of free, creative, and inductive thinking</i></p>
<ul style="list-style-type: none"> • Research, analysis, and synthesis of data and information using appropriate technologies • Adaptation to new situations • Decision making • Independent work • Generating new research ideas • Respect for the natural environment • Exercise of critical and self-critical thinking • Promotion of free, creative and inductive thinking

● **MODULE CONTENT**

<p>The module introduces the basic concepts of climate change and presents the role of climatic databases and indicators in understanding, monitoring, and assessing climate change. It familiarizes trainees with the types of climate data available, the tools used to access them, and the interpretation of climatic indicators in environmental research and policy. The module covers the following topics:</p> <ul style="list-style-type: none"> ● Introduction to climate change and its importance in environmental monitoring and research ● Introduction to climate change data sources and climatic databases ● Global and regional climate change data repositories (e.g., meteorological observations, satellite datasets, reanalysis products) ● Climatic variables commonly used in climate change studies (temperature, precipitation, atmospheric and oceanographic parameters) ● Climate indicators and their role in climate monitoring ● Indicators of climate variability and climate change ● Basic approaches for processing and interpreting climatic data ● Applications of climate indicators in environmental management and climate policy

● **TEACHING and LEARNING METHODS - ASSESSMENT**

<p>Training Method <i>Physical presence/on-line /blended.</i></p>	Physical Presence
<p>Use Of Information And Communication Technologies (ICT) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i></p>	<p>ICT is used in the following ways:</p> <ul style="list-style-type: none"> ● Presentation of lecture material using multimedia tools ● Demonstration of online climatic databases and climate data portals ● Use of digital platforms for accessing and visualizing climatic datasets ● Communication with trainees through electronic learning platforms and email
<p>Evaluation Of Trainees <i>Description of the evaluation process</i></p> <p><i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i></p> <p><i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i></p>	<p>Evaluation Language: English</p> <p>Evaluation Methods:</p> <ul style="list-style-type: none"> ● Short answer questions assessing understanding of climatic databases and indicators ● Problem-solving exercises related to interpretation of climatic data ● Participation in discussion and in-class activities

● **RECOMMENDED BIBLIOGRAPHY**

<ul style="list-style-type: none"> ● Intergovernmental Panel on Climate Change (IPCC), <i>Climate Change Assessment Reports</i> (https://www.ipcc.ch/reports/) ● World Meteorological Organization (WMO), <i>Guidelines on the Calculation of Climate Normals</i> (https://tinyurl.com/wmoguidelines) ● World Meteorological Organization (WMO), <i>Guidelines on Climate Indicators and Indices</i> (https://tinyurl.com/wmoindices) ● (WCRP), <i>Expert Team on Climate Change Detection and Indices (ETCCDI)</i> – Climate change detection and climate-extreme indices (https://www.wcrp-climate.org/etccdi) ● National Oceanic and Atmospheric Administration (NOAA) Climate Data Resources (https://www.noaa.gov/education/resource-collections/data/climate) ● Michael E. Mann, <i>The New Climate War: The Fight to Take Back Our Planet</i> (https://tinyurl.com/thenewclimatewar)

Module

Tutors	Dr. Anastasia Makri
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- GENERAL**

Title of Module	From agricultural residues to bioenergy: bio-inspired solutions for a climate-resilient bioeconomy		
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units	
Lecture	2	0.1167	
Language of Tutoring and Examination:	English		

- EDUCATIONAL OBJECTIVES**

<p>Educational Objectives</p> <p>The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.</p>
<p>Upon successful completion of this module, trainees will be able to:</p> <ul style="list-style-type: none"> • Explain the importance of agricultural residues and agro-industrial waste streams as sustainable bioresources for energy and resource recovery. • Describe the principles of anaerobic digestion and biological treatment processes for bioenergy production. • Understand how bio-inspired and nature-based solutions, such as microbial communities and microalgae systems, can enhance biomass conversion and environmental performance. • Evaluate the role of biogas production technologies in supporting a climate-resilient and circular bioeconomy. • Evaluate the role of biogas production technologies in supporting a climate-resilient and circular bioeconomy. • Recognize the environmental benefits of integrating waste valorization, nutrient recovery, and renewable energy production. • Develop critical thinking regarding sustainable waste management strategies and their contribution to climate change mitigation and adaptation.
<p>General Skills</p> <p><i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i></p> <p><i>Research, analysis, and synthesis of data and information, using the necessary technologies</i></p> <p><i>Adaptation to new situations</i></p> <p><i>Decision making</i></p> <p><i>Independent work</i></p> <p><i>Teamwork</i></p> <p><i>Working in an international environment</i></p> <p><i>Working in an interdisciplinary environment</i></p> <p><i>Generating new research ideas</i></p> <p><i>Project planning and management</i></p> <p><i>Respect for diversity and multiculturalism</i></p> <p><i>Respect for the natural environment</i></p> <p><i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i></p> <p><i>Exercise of critical and self-critical thinking</i></p> <p><i>Promotion of free, creative, and inductive thinking</i></p>
<p>At the end of the module, trainees are expected to develop the following skills:</p> <ul style="list-style-type: none"> • Ability to interpret experimental results from bioenergy systems and environmental biotechnology applications. • Adaptation to emerging challenges related to climate change and sustainable resource use. • Independent and critical thinking in the evaluation of bio-based technological solutions. • Ability to work in interdisciplinary and international scientific environments. • Generation of new research ideas related to circular bioeconomy and climate resilience. • Awareness for the natural environment and sustainable resource management.

● **MODULE CONTENT**

The module introduces the concept of bioenergy production from agricultural and agro-industrial residues, highlighting its importance for the transition toward a climate-resilient bioeconomy. The lecture begins with an overview of current challenges related to waste management, increasing energy demand, and climate change. Particular emphasis is given to the potential of agricultural residues as valuable feedstocks for renewable energy production. The course then presents the fundamentals of anaerobic digestion, including microbial processes involved in biomass degradation and methane production. Special attention is given to bio-inspired approaches, such as the use of rumen microorganisms to enhance the hydrolysis of lignocellulosic biomass.

The module also explores co-digestion strategies using agricultural residues, manure, and agro-industrial wastes in order to improve process efficiency and stability. Furthermore, the lecture discusses the valorization of anaerobic digestate through microalgae cultivation, demonstrating how biological systems can contribute to nutrient recovery, wastewater treatment, and additional biomass production.

Finally, the module highlights how integrated bioenergy systems support the development of circular and climate-resilient bioeconomy models, where waste streams are transformed into valuable resources while reducing environmental impacts.

● **TEACHING and LEARNING METHODS - ASSESSMENT**

<p>Training Method <i>Physical presence/on-line /blended.</i></p>	Physical Presence
<p>Use Of Information And Communication Technologies (Ict) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i></p>	Use of PowerPoint presentations , visual diagrams, and process flow illustrations to support understanding of complex biological and engineering concepts. Scientific figures, experimental data, and schematic representations of bioenergy systems are used to facilitate learning and encourage discussion among trainees.
<p>Evaluation Of Trainees <i>Description of the evaluation process</i></p> <p><i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i></p> <p><i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i></p>	<p>Evaluation Language: English</p> <p>Evaluation Methods:</p> <ul style="list-style-type: none"> ● Active participation and discussion during the lecture ● Short reflective discussion or oral feedback on the presented concepts ● Informal assessment of understanding through questions during the session <p>Evaluation criteria focus on:</p> <ul style="list-style-type: none"> ● Understanding of the core principles of bioenergy production from biomass residues ● Ability to relate biological treatment technologies to circular bioeconomy and climate resilience concepts ● Critical thinking regarding sustainable resource management strategies

● **RECOMMENDED BIBLIOGRAPHY**

- Makri, A., Ntougias, S., & Melidis, P. (2024). Enhancing anaerobic degradation of corn stover residues and biogas production via rumen microorganisms. *Environmental Processes*, 11(4), 54.
- Li, Y., Xu, F., Li, Y., Lu, J., Li, S., Shah, A., ..., Li, G. (2018). Reactor performance and energy analysis of solid state anaerobic co-digestion of dairy manure with corn stover and tomato residues. *Waste Management*, 73, 130-139.
- Li, Y., Li, Y., Zhang, D., Li, G., Lu, J., & Li, S. (2016). Solid state anaerobic co-digestion of tomato residues with dairy manure and corn stover for biogas production. *Bioresource technology*, 217, 50-55.

Module

Tutors	Dr. Anastasia Mirli
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- GENERAL**

Title of Module	Ecosystem services for coastal protection		
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units	
Lecture	2	0.1167	
Language of Tutoring and Examination:	English		

- EDUCATIONAL OBJECTIVES**

<p>Educational Objectives</p> <p>The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.</p>
<p>By completing this short course, students will understand the concept of ecosystem services and their role in coastal protection. Through the course there will be a brief introduction to the main types of coastal ecosystems that support shoreline stability and risk reduction, including wetlands, dunes, and seagrass meadows.</p> <p>This course aims to familiarize students with the principles used to assess and evaluate ecosystem services related to coastal protection and gain an understanding of how to consider these services within coastal management and planning frameworks.</p> <p>Overall, the course is intended to provide students with a thorough understanding of the links between ecosystem functioning, ecosystem service assessment, and sustainable coastal management approaches.</p>
<p>General Skills</p> <p><i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i></p> <p><i>Research, analysis, and synthesis of data and information, using the necessary technologies</i></p> <p><i>Adaptation to new situations</i></p> <p><i>Decision making</i></p> <p><i>Independent work</i></p> <p><i>Teamwork</i></p> <p><i>Working in an international environment</i></p> <p><i>Working in an interdisciplinary environment</i></p> <p><i>Generating new research ideas</i></p> <p><i>Project planning and management</i></p> <p><i>Respect for diversity and multiculturalism</i></p> <p><i>Respect for the natural environment</i></p> <p><i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i></p> <p><i>Exercise of critical and self-critical thinking</i></p> <p><i>Promotion of free, creative, and inductive thinking</i></p>
<ul style="list-style-type: none"> • Working in an interdisciplinary environment • Decision making • Exercise of critical and self-critical thinking • Respect for the natural environment

- MODULE CONTENT**

<p>The course aims to provide students with an understanding of the role of ecosystem services (ES) in coastal protection.</p> <p>First of all, the course will begin with a brief overview of the ES concept and its relevance to coastal systems, by presenting the main ES categories and discussing their importance in addressing climate-related coastal hazards. Following, the key coastal ecosystems that support shoreline stability and reduce risks will be presented. Additionally, the ecological processes through which these ecosystems assist in reducing the coastal hazards (e.g., erosion, coastal flooding) will be explained. (50 minutes).</p>
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The second part of the course will provide an overview of the basic methods used to assess ES, using several selected case studies. Moreover, the course will cover the integration of ecosystem services into coastal management and planning, highlighting the role of nature-based solutions in sustainable coastal protection strategies. (60 minutes).
 In the end, a summary of the key concepts, followed by an open discussion regarding the role of ecosystem services in future coastal management approaches, will take place. (10 minutes).

● **TEACHING and LEARNING METHODS - ASSESSMENT**

Training Method <i>Physical presence/on-line /blended.</i>	Physical Presence
Use Of Information And Communication Technologies (Ict) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i>	ICT tools will be used during the course for the digital presentation and visual materials used. Moreover, online resources will be used to support the comprehension of the ES assessment. Communication with students and distribution of course materials will be facilitated via email. Laboratory education is not included in this module.
Evaluation Of Trainees <i>Description of the evaluation process</i> <i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i> <i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i>	Evaluation Language: English Evaluation Methods: On-line Multiple-choice Test

● **RECOMMENDED BIBLIOGRAPHY**

- Costanza, R., d’Arge, R., de Groot, R., et al. (1997). The value of the world’s ecosystem services and natural capital. *Nature*, 387, 253–260. <https://doi.org/10.1038/387253a0>
- Millennium Ecosystem Assessment. (2005). *Ecosystems and human well-being: Synthesis*. Island Press.
- Barbier, E. B. (2015). Valuing the storm protection service of estuarine and coastal ecosystems. *Ecosystem Services*, 11, 32–38. <https://doi.org/10.1016/j.ecoser.2014.08.010>
- Bukvic, A., Rohat, G., Apotsos, A., de Sherbinin, A. (2020). A systematic review of coastal vulnerability mapping. *Sustainability*, 12(7), 2822. <https://doi.org/10.3390/su12072822>
- IPCC. (2022). *Climate change 2022: Impacts, adaptation and vulnerability*. Cambridge University Press. <https://doi.org/10.1017/9781009325844>
- Temmerman, S., Meire, P., Bouma, T. J., et al. (2013). Ecosystem-based coastal defence in the face of global change. *Nature*, 504, 79–83. <https://doi.org/10.1038/nature12859>
- Perricone, V., Storlazzi, C. D., Harris, D. L., et al. (2023). Nature-based and bioinspired solutions for coastal protection. *ICES Journal of Marine Science*, 80(5), 1218–1234. <https://doi.org/10.1093/icesjms/fsad068>
- Mirli, A., Latinopoulos, D., Galidaki, G., Bakeas, K., Kagalou, I. (2024). Assessing historical LULC changes’ effect on ecosystem services provisioning and their values in a Mediterranean coastal lagoon complex. *Land*, 13(8), 1277. <https://doi.org/10.3390/land13081277>

Module

Tutors	Dr. Stamatios Petalas
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- GENERAL**

Title of Module	Coastal eco-hydraulic practices for beach protection and restoration		
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units	
Lecture	2	0.1167	
Language of Tutoring and Examination:	English		

- EDUCATIONAL OBJECTIVES**

<p>Educational Objectives</p> <p>The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.</p>
<ul style="list-style-type: none"> Understand the basic physical processes in the coastal environment Understand the vulnerabilities existing within the coastal environment Review potential solutions for coastal erosion Familiarize and review tools used for coastal protection and planning
<p>General Skills</p> <p><i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i></p> <p><i>Research, analysis, and synthesis of data and information, using the necessary technologies</i></p> <p><i>Adaptation to new situations</i></p> <p><i>Decision making</i></p> <p><i>Independent work</i></p> <p><i>Teamwork</i></p> <p><i>Working in an international environment</i></p> <p><i>Working in an interdisciplinary environment</i></p> <p><i>Generating new research ideas</i></p> <p><i>Project planning and management</i></p> <p><i>Respect for diversity and multiculturalism</i></p> <p><i>Respect for the natural environment</i></p> <p><i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i></p> <p><i>Exercise of critical and self-critical thinking</i></p> <p><i>Promotion of free, creative, and inductive thinking</i></p>
<ul style="list-style-type: none"> Research, analysis, and synthesis of data and information, using the necessary technologies Generating new research ideas

- MODULE CONTENT**

<ul style="list-style-type: none"> Physics of coastal processes Wave transformations in the coastal zone Coastal erosion under climate change Proposed ecological solutions and practices for coastal protection Presentation of available modelling systems for coastal planning
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- TEACHING and LEARNING METHODS - ASSESSMENT**

Training Method <i>Physical presence/on-line /blended.</i>	Physical Presence
Use Of Information And Communication Technologies (Ict) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i>	General scripting, Python (if needed)

<p>Evaluation Of Trainees <i>Description of the evaluation process</i></p> <p><i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i></p> <p><i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i></p>	<p>Evaluation Language: English Evaluation Methods: Multiple Choice Test</p>
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● **RECOMMENDED BIBLIOGRAPHY**

1. Pang, T., Wang, X., Nawaz, R. A., Keefe, G., Adekanmbi, T. (2023). Coastal erosion and climate change: A review on coastal-change process and modeling. *Ambio*, 52(12), 2034–2052. <https://doi.org/10.1007/s13280-023-01901-9>
2. Rocha, C., Antunes, C., Catita, C. (2023). Coastal indices to assess sea-level rise impacts—A brief review of the last decade. *Ocean & Coastal Management*, 237, 106536. <https://doi.org/10.1016/j.ocecoaman.2023.106536>
3. Serafim, M. B., Siegle, E., Corsi, A. C., Bonetti, J. (2019). Coastal vulnerability to wave impacts using a multi-criteria index: Santa Catarina (Brazil). *Journal of Environmental Management*, 230, 21–32. <https://doi.org/10.1016/j.jenvman.2018.09.052>
4. Williams, A. T., Rangel-Buitrago, N., Pranzini, E., Anfuso, G. (2018). The management of coastal erosion. *Ocean & Coastal Management*, SI: MSforCEP, 156, 4–20. <https://doi.org/10.1016/j.ocecoaman.2017.03.022>
5. Williams, S. J. (2013). Sea-Level Rise Implications for Coastal Regions. *Journal of Coastal Research*, 63(sp1), 184–196. <https://doi.org/10.2112/SI63-015.1>
6. Zhang, N., Zhang, Q., Zou, G., Jiang, X. (2016). Estimation of the transmission coefficients of wave height and period after smooth submerged breakwater using a non-hydrostatic wave model. *Ocean Engineering*, 122, 202–214. <https://doi.org/10.1016/j.oceaneng.2016.06.037>

Module

Tutors	Prof. Spyridon Ntougias · Prof. Ifigeneia Kagkalou · Prof. Georgios Sylaios · Prof. Paraschos Melidis · Prof. Christos Akratos · Assistant Prof. Nikolaos Remmas
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- GENERAL**

Title of Module	Educational visit – Sustainability Proposal Design.		
Autonomous Teaching Activities <i>in case credits are awarded separately for distinct parts e.g. Lectures, Lab Exercises, etc. Specify the total teaching hours and credits.</i>	Total Teaching Hours	Credits Units	
Field visit	8	0.4833	
Language of Tutoring and Examination:	English		

- EDUCATIONAL OBJECTIVES**

Educational Objectives
The Educational objectives of the thematic unit/course describe the specific knowledge, skills, and abilities of an appropriate level that learners will acquire upon successful completion of the course.
The objective of this educational visit is to provide participants with practical exposure to nature-based solutions and sustainability practices that support climate resilience and the bioeconomy. Through field observation and guided analysis, learners will connect theoretical concepts with real-world applications and develop the ability to critically evaluate environmental interventions. Upon successful completion of the module, participants will be able to: <ul style="list-style-type: none"> • Understand the role of nature-based solutions in addressing climate change, ecosystem restoration, and sustainable development. • Identify key environmental, social, and economic factors that influence the design of sustainability initiatives. • Observe and analyze real-life examples of sustainable land management and climate resilience strategies during the field visit. • Apply interdisciplinary thinking to assess environmental challenges and propose context-appropriate sustainability solutions.
General Skills <i>Note the general skills that the trainee acquires. Which of these does the course aim at?</i>
<i>Research, analysis, and synthesis of data and information, using the necessary technologies</i> <i>Adaptation to new situations</i> <i>Decision making</i> <i>Independent work</i> <i>Teamwork</i> <i>Working in an international environment</i> <i>Working in an interdisciplinary environment</i> <i>Generating new research ideas</i> <i>Project planning and management</i> <i>Respect for diversity and multiculturalism</i> <i>Respect for the natural environment</i> <i>Demonstrating social, professional, and ethical responsibility and sensitivity to gender issues</i> <i>Exercise of critical and self-critical thinking</i> <i>Promotion of free, creative, and inductive thinking</i>
<ul style="list-style-type: none"> • Adaptation to new situations • Teamwork • Working in an international environment • Working in an interdisciplinary environment • Generating new research ideas • Project planning and management • Respect for the natural environment • Exercise of critical and self-critical thinking

- Promotion of free, creative, and inductive thinking

• **MODULE CONTENT**

The module consists of an educational field visit to selected sites across the East Macedonia and Thrace region of Greece, where participants will explore practical applications of nature-based solutions, biodiversity conservation practices, and innovative agricultural technologies that support climate resilience and sustainable bioeconomy development.

During the visit, participants will be introduced to:

- Nature-Based Solutions (NbS) systems implemented for ecosystem restoration, sustainable land management, and climate adaptation.
- Biodiversity hotspots and protected ecosystems of the region, focusing on habitat conservation, ecosystem services, and landscape management practices.
- Examples of precision irrigation applications used in agriculture to optimize water use efficiency, improve crop productivity, and reduce environmental impacts.
- Interactions between natural ecosystems, agricultural systems, and local communities within the regional socio-ecological landscape.
- Case studies demonstrating how scientific knowledge, digital technologies, and traditional land management practices can be integrated to enhance climate resilience and support the bioeconomy.

The educational visit will include on-site observations, expert explanations, and guided discussions, enabling participants to analyze real-world sustainability practices and reflect on how such approaches can inform the development of sustainability proposals.

• **TEACHING and LEARNING METHODS - ASSESSMENT**

Training Method <i>Physical presence/on-line /blended.</i>	Physical presence
Use Of Information And Communication Technologies (Ict) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with Trainees</i>	Digital technologies in Nature-Based Solutions (NbS) and sustainable agricultural systems
Evaluation Of Trainees <i>Description of the evaluation process</i> <i>Evaluation Language, Evaluation Methods, Formative or Summative, Multiple Choice Test, Short Answer Questions, Essay Questions, Problem Solving, Written Assignment, Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other</i> <i>Explicitly specified evaluation criteria are mentioned and if and where they are accessible to the trainees.</i>	Evaluation Language: English Evaluation Methods: Report

• **RECOMMENDED BIBLIOGRAPHY**

- Marzo, A., Silva, J. R. M., Masi, F., Rizzo, A., Cirelli, G. L. (2025). A review of the full-scale constructed wetlands for the treatment and management of winery wastewater. *Current Opinion in Environmental Science & Health*, 100680.
- Caselles-Osorio, A., Puigagut, J., Segú, E., Vaello, N., Granés, F., García, D., García, J. (2007). Solids accumulation in six full-scale subsurface flow constructed wetlands. *Water research*, 41(6), 1388-1398.
- Adeyemi, O., Grove, I., Peets, S., Norton, T. (2017). Advanced monitoring and management systems for improving sustainability in precision irrigation. *Sustainability*, 9(3), 353.