



Course guide

250MEA009 - 250MEA009 - Nature-Based Solutions

Last modified: 27/06/2024

Unit in charge:	Barcelona School of Civil Engineering	
Teaching unit:	751 - DECA - Department of Civil and Environmental Engineering.	
Degree:	MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2024). (Optional subject).	
Academic year: 2024	ECTS Credits: 5.0	Languages: Spanish

LECTURER

Coordinating lecturer:	ENRICA UGGETTI
Others:	Roca Bosch, Elisabeth Russo, Beniamino Uggetti, Enrica

TEACHING METHODOLOGY

The course consists of 3 hours per week of classroom activity. Between half and two thirds of the 3h class session, will be devoted to theoretical concepts and the rest of the period to individual or group exercises about calculations or discussions about the topic considered. The discussion part aims to help the acquisition of the knowledge explained during the theoretical part. The ATENEA virtual campus will hold the oral presentation of the theoretical part, the essential support information for the theory and the practical part of the sessions. All student must carry out a project in group. At the end of the course, each group will expose the project to be discussed by the rest of the colleagues and teacher.

LEARNING OBJECTIVES OF THE SUBJECT

In this subject, different aspects of different nature-based solutions (either for water management solutions, solutions for cities, adaptation of coastal fronts, hybrid solutions) will be addressed. Emphasis will be placed on both the technical aspects and the environmental and social benefits of technologies. The challenges, barriers and drivers involved in its planning, implementation and management are also addressed. To this end, the analysis of the perception and social acceptance of nature-based solutions will be discussed. Aspects of governance and the participatory processes necessary for its good reception and management in real contexts will be evidenced.

Specific objectives:

- Know the different solutions based on nature
- Understand the technical aspects and functions of different nature-based solutions
- Understand participatory processes and the perception and social acceptance of nature-based solutions

In this subject, students are sought to obtain a global vision of nature-based solutions under different aspects: technological, environmental, social and governance. In this subject, students are encouraged to actively participate in the classes and to be able, through directed works on real case studies, to examine in detail and evaluate the functionality of different nature-based solutions.



STUDY LOAD

Type	Hours	Percentage
Self study	80,0	63.95
Hours small group	9,8	7.83
Hours medium group	9,8	7.83
Hours large group	25,5	20.38

Total learning time: 125.1 h

CONTENTS

Introduction

Description:

The structure of the subject will be presented. The concepts of sustainable development goals and circular water economy will be introduced. Emphasis will be placed on defining nature based solutions (NBS) and its objectives, as well as the standards to be followed and the European Commission's position towards these systems.

Aspects of social acceptance and frameworks of these systems will be introduced.

Full-or-part-time: 8h 20m

Theory classes: 1h 42m

Practical classes: 0h 39m

Laboratory classes: 0h 39m

Self study : 5h 20m

NBS for water management and treatment

Description:

The different types of nature-based solutions for water management (e.g. recharge of aquifers, constructed wetlands, environmental restoration) will be presented, addressing the technical aspects of each of them.

The principles of design and sizing of some of the solutions will be introduced.

Real cases of application of these systems will be analyzed.

Full-or-part-time: 16h 40m

Theory classes: 3h 24m

Practical classes: 1h 18m

Laboratory classes: 1h 18m

Self study : 10h 40m

NBS in coastal areas and in sustainable agriculture

Description:

The different types of nature-based solutions in coastal areas and in sustainable agriculture (e.g. green ports, recovery of agricultural runoff nutrients, etc.) will be presented addressing the technical aspects of each of them.

Real cases of application of these systems will be analyzed.

Full-or-part-time: 16h 40m

Theory classes: 3h 24m

Practical classes: 1h 18m

Laboratory classes: 1h 18m

Self study : 10h 40m



Sustainable Urban Drainage Systems (SUDS)

Description:

This module will present the Urban Sustainable Drainage Systems, analyzing the regulatory framework of these types of techniques and some guides of design, implementation and maintenance both locally and internationally.

In particular, the different classifications of SUDS will be reviewed and some of these solutions will be introduced. As a culmination of this module, the hydrological modeling of this type of techniques will be addressed to evaluate its hydraulic and environmental benefits.

Full-or-part-time: 25h

Theory classes: 5h 06m

Practical classes: 1h 57m

Laboratory classes: 1h 57m

Self study : 16h

Conflicts and social acceptance of NBS

Description:

NBS are not exempt from generating conflicts and producing negative impacts (disservices) that can generate resistance and lack of social acceptance. In this session, the concept of socio-environmental conflict within the framework of NBS, the level of social acceptance against new NBS projects and the concern and distrust that can generate aspects such as disinformation, the unequal distribution of costs and benefits, among other topics, will be reviewed. Strategies to address these conflicts and how to improve social acceptance of projects will be discussed.

Full-or-part-time: 8h 20m

Theory classes: 1h 42m

Practical classes: 0h 39m

Laboratory classes: 0h 39m

Self study : 5h 20m

The governance of NBS throughout its planning, management and evaluation process

Description:

Different models of governance will be presented. The participation of multiple actors, including local, scientific, political, economic communities, is essential to the success of these initiatives. The analysis of the system of actors, their role and their collaboration forms will be addressed. The financing mechanisms.

The planning, implementation and management of NBS requires overcoming a series of technical, economic, social and institutional challenges and barriers that need to be foreseen in all NBS projects. This session will give a vision of the entire NBS process, from its design to its implementation and maintenance, pointing out possible obstacles and highlighting management strategies. Holistic assessment frameworks will be presented for application in case of study.

Full-or-part-time: 16h 40m

Theory classes: 3h 24m

Practical classes: 1h 18m

Laboratory classes: 1h 18m

Self study : 10h 40m



Participation and involvement of local communities in NBS. The co-creation, co-management and co-evaluation of NBS, as empowerment and transformation strategies

Description:

The participation of local communities and citizens at different times of a NBS project will be addressed as fundamental strategies to ensure the success and sustainability of NBS. Mechanisms to involve citizenship, foster awareness and social learning are explained. Success stories and good practices on participation were presented.

Full-or-part-time: 8h 20m

Theory classes: 1h 42m

Practical classes: 0h 39m

Laboratory classes: 0h 39m

Self study : 5h 20m

GRADING SYSTEM

The qualification of the subject is as follows:

- Exams 30%
- Project 50%
- Reports 20%
- Class exercises 10%

EXAMINATION RULES.

EXAMS: individual exam.

COURSE WORK: it is done in a group of 2-3 people and will include a technical part and a social part of a system based on nature.

REPORTS ON VISITS: during the course there will be 2 visits to nature-based systems facilities. You will have to submit a report or solve an individual questionnaire.



BIBLIOGRAPHY

Basic:

- O'Hogain, S.; McCarton, L. A technology portfolio of nature based solutions: innovations in water management [on line]. Cham: Springer International Publishing, 2018 [Consultation: 04/10/2024]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5387461>. ISBN 9783319732817.
- Haase, D.; Haase, A.; Wolff, M.; Dushkova, D. (eds.). Nature-based solutions (NBS) in cities and their interaction with urban land, ecosystems, built environment and people: debating societal implications [on line]. Basel: MDPI, 2021 [Consultation: 13/09/2024]. Available on: <https://www.mdpi.com/books/reprint/4423-nature-based-solutions-nbs-in-cities-and-their-interaction-with-urban-land-ecosystems-builit>. ISBN 9783036521442.
- Cohen-Shacham, E.; Walters, G.; Janzen, C.; Maginnis, S. (eds.). Nature-based solutions to address global societal challenges [on line]. Gland, Switzerland: IUCN, 2016 [Consultation: 13/09/2024]. Available on: <https://portals.iucn.org/library/sites/library/files/documents/2016-036.pdf>. ISBN 9782831718125.
- IUCN global standard for nature-based solutions: a user-friendly framework for the verification, design and scaling up of NbS. First edition. Gland, Switzerland: International Union for Conservation de Nature, 2020. ISBN 9782831720586.
- Ajuntament de Barcelona. Guia tècnica per al disseny de sistemes de drenatge urbà sostenible [on line]. Ajuntament de Barcelona, 2020 [Consultation: 13/09/2024]. Available on: https://ajuntament.barcelona.cat/ecologiaurbana/sites/default/files/PlecPrescripcionsTecniquesDrenatge_Guia.pdf.
- Guías de adaptación al riesgo de inundación: Sistemas Urbanos de Drenaje Sostenible. Madrid: Ministerio para la transición ecológica, 2019.
- Woods Ballard, B.; Wilson, S.; Udale-Clarke, H.; Illman, S.; Scott, T.; Ashley, R.; Kellagher, R. The SuDS manual. CIRIA, 2015. ISBN 9780860177593.
- Kabisch, Kabisch, N.; [i 11 més]; [i 11 més]. "Nature-based solutions to climate change mitigation and adaptation in urban areas: perspectives on indicators, knowledge gaps, barriers, and opportunities for action". Ecology & society [on line]. 2016, vol. 21, issue 2, article 39 [Consultation: 13/09/2024]. Available on: <https://www-jstor-org.recursos.biblioteca.upc.edu/stable/26270403?sid=primo&seq=1>.
- Nesshöver, C.; [i 16 més]. "The science, policy and practice of nature-based solutions: an interdisciplinary perspective". Science of the Total Environment [on line]. Vol. 579, 1 february 2017, pp. 1215-1227 [Consultation: 13/09/2024]. Available on: <https://doi.org/10.1016/j.scitotenv.2016.11.106>.
- Cohen-Shacham, E.; [i 11 més]. "Core principles for successfully implementing and upscaling Nature-based Solutions". Environmental Science & Policy [on line]. Volume 98, August 2019, Pages 20-29 [Consultation: 13/09/2024]. Available on: <https://doi.org/10.1016/J.ENVSCI.2019.04.014>.
- European Commission. Evaluating the impact of nature-based solutions: a handbook for practitioners [on line]. Luxembourg: Publications Office of the European Union, 2021 [Consultation: 13/09/2024]. Available on: <https://op.europa.eu/en/publication-detail/-/publication/d7d496b5-ad4e-11eb-9767-01aa75ed71a1/language-en>. ISBN 9789276228219.

Complementary:

- Metcalf & Eddy; Tchobanoglous, G. [et al.]. Wastewater engineering: treatment and resource recovery [on line]. 5th ed. New York: McGraw-Hill Education, 2014 [Consultation: 13/09/2024]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5662641>. ISBN 9780077441210.