

Course guide

480USE001 - 480USE001 - Sustainability, Development and State of the World

Last modified: 05/06/2026

Unit in charge:	Barcelona School of Civil Engineering	
Teaching unit:	717 - DEGD - Department of Engineering Graphics and Design. 748 - FIS - Department of Physics.	
Degree:	MASTER'S DEGREE IN SUSTAINABILITY AND STRATEGIES FOR A JUST GLOBAL TRANSITION (Syllabus 2026). (Compulsory subject).	
Academic year: 2026	ECTS Credits: 5.0	Languages: Spanish

LECTURER

Coordinating lecturer:	Bàrbara Sureda Carbonell
Others:	Olga Alcaraz Sendra Bàrbara Sureda Carbonell

PRIOR SKILLS

They are not required

REQUIREMENTS

They are not required

TEACHING METHODOLOGY

- MD.1.- Active expository teaching (participatory lecture).
- MD.2.- Flipped Classroom.
- MD.4.- Case studies.

LEARNING OBJECTIVES OF THE SUBJECT

Knowledge:

- K01.1: Recognize the dynamics of socioeconomic and environmental systems at different spatial and temporal scales using analysis and modeling tools.
- K02.1: Identify key conceptual and regulatory frameworks for the transition towards sustainable and equitable development models.
- K05.1: Recognize adaptation and mitigation strategies in different sectors to strengthen socio-ecological resilience.

Skills:

- S01.2: Analyze alternative economic models that promote equity and sustainability.
- S02.1: Analyze the main impacts of climate change on socio-ecological systems.

Competencies:

- RAT_UPC_2.2: Make informed decisions when implementing sustainable transition policies and plans.
- C02.1: Plan sustainable development policies and programs with a multiscale approach.
- C03.1: Critically assess sustainable transition models considering their global impacts.

STUDY LOAD

Type	Hours	Percentage
Hours large group	22,7	18.15
Self study	80,0	63.95
Hours medium group	11,4	9.11
Hours small group	11,0	8.79

Total learning time: 125.1 h

CONTENTS

Topic 1. Dynamics of change: personal and interpersonal

Description:

Sensitivity, empathy, cooperation, conflict analysis and resolution, decision-making... This is a cross-cutting topic that will be developed throughout the course using various tools and methodologies designed to address and facilitate the development of personal and interpersonal dynamics of change.

Full-or-part-time: 3h

Theory classes: 3h

Topic 2. Development model: growth dynamics

Description:

Pressures: carrying capacity, population, urbanization, imbalances, economic growth, growth in consumption (material resources, energy consumption, food resources...) and waste generation.

Related activities:

BAU variables (Business As Usual: population, GDP, energy consumption...).

Agri-food model and land use.

Full-or-part-time: 9h

Theory classes: 9h

Topic 3. Development model: impacts and conflicts

Description:

Ecological footprint vs. biocapacity. Planetary boundaries and socioeconomic metabolism. Impacts on natural cycles. Impacts on water, soil, food, and health. Global impacts. External debt. Socio-ecological conflicts and global justice. Dilemmas between economic growth and biophysical limits.

Related activities:

Analysis of greenhouse gas emissions from different countries.

Case study (environmental conflicts).

Full-or-part-time: 6h

Theory classes: 6h

Topic 4. Sustainability paradigm

Description:

Foundations of the concept of sustainability. Systemic paradigm vs. mechanistic paradigm. Evolution of the concept of sustainable development. Interpretations of the concept (weak, strong, and sensitive sustainability). Sustainable Human Development. Economic and social sustainability indicators (GDP vs. alternative indicators: HDI, Genuine Progress Indicator, Gross National Happiness). Potential conflicts between efficiency, equity, and sustainability. Major couplings and decoupling challenges.

Related activities:

Ecological footprint vs. biocapacity.
Indicators and indices.
Gapminder.

Full-or-part-time: 6h

Theory classes: 6h

Topic 5. Sustainable strategies and resilience

Description:

Alternatives and new paradigms: economy for the common good, "buen vivir" (good living), degrowth, and circular economy. Tools and instruments: universal basic income, environmental certifications, eco-labels, environmental impact studies, alternative consumption, sustainable management of the commons.

Related activities:

Analysis of sustainable strategies.

Full-or-part-time: 6h

Theory classes: 6h

Topic 6. International organizations and Development Agenda

Description:

Bretton Woods organizations. UN. Other organizations. From the MDGs (Millennium Development Goals) to the SDGs (Sustainable Development Goals). Other agendas.

Related activities:

International organizations.
SDGs.

Full-or-part-time: 6h

Theory classes: 6h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the [Action Framework for Academic Integrity in Assessment at the UPC](#).

Directed activities grades (AD) = 40%

Midterm exam (EP) = 30%

Final exam (EF) = 30%

Final grade (Nf): $0.40 \cdot AD + 0.30 \cdot EP + 0.30 \cdot EF$

Specification:

- There will be an assessment of directed activities (in-person or remote/non-contact) corresponding to the submission of proposed assignments (AD type). These may be individual or in groups, according to each professor's criteria.
- There will be a midterm exam (EP) in the first half of the course and a final exam (EF), lasting a maximum of 2 hours, which will consist of questions related to the theoretical knowledge of the course syllabus and aimed at assessing the learning objectives achieved by the student.

BIBLIOGRAPHY

Basic:

- De Vries, B.J.M.. Sustainability science. Cambridge: Cambridge University Press, 2013. ISBN 9780521184700.
- Costanza, R.; Cumberland, J.H.; Daly, H.; Goodland, R.; Norgaard, R.B.; Kubiszewski, I.; Franco, C.. An introduction to ecological economics. Second edition. Raton, FL: CRC Press, Taylor & Francis Group, 2015. ISBN 9781566706841.
- Dresner, S.. The principles of sustainability. Second edition. London: Earthscan, 2008. ISBN 9781844074969.
- Mulder, K. (ed.). Sustainable development for engineers: a handbook and resource guide [on line]. Sheffield: Greenleaf, 2006
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<https://www-taylorfrancis-com.recursos.biblioteca.upc.edu/books/mono/10.4324/9781351282925/sustainable-development-engineer-s-karel-mulder>. ISBN 1874719195.
- Meadows, D.; Randers, J.; Meadows, D. The limits to growth: the 30-year update. White River Junction, Vt: Chelsea Green Pub., 2004. ISBN 1931498512.
- Weiner, R.F.; Matthews, R.A. Environmental engineering [on line]. 4th ed.. Amsterdam: Butterworth Heinemann, 2003
[Consultation : 09/06/2026]. Available on :
<https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/edited-volume/9780750672948/environmental-engineering>. ISBN 9780750672948.
- Diamond, J.M. Collapse: how societies choose to fail or succeed. New York: Penguin, 2011. ISBN 9780143117001.
- Mackenzie L.; Davis, M.L.; Cornwell, D.A. Introduction to environmental engineering [on line]. 6th ed.. New York: McGraw-Hill, 2023
[Consultation : 09/06/2026]. Available on :
<https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=6883028>. ISBN 9781264360932.

RESOURCES

Other resources:

- Class material available on ATENEA

- Nakicenovic, N.; Rockström, J.; Gaffney, O. and Zimm, C. (2016) Global commons in the anthropocene: world development on a stable and resilient planet. IIASA Working Paper WP-16-019. Laxenburg, Austria: International Institute for Applied Systems Analysis. <https://pure.iiasa.ac.at/id/eprint/14003/> />
- United Nations Education, Scientific and Cultural Organization (2010), Engineering: issues challenges and opportunities for development: UNESCO report. 396 p. ISBN: 978-9231041563. <https://unesdoc.unesco.org/ark:/48223/pf0000189753> />
- World Bank Group. World Development Report, (annual report). <https://openknowledge.worldbank.org/collections/3d9bbb6-c007-5043-b655-04d8a1cfbfb2> />
- United Nations Development Program. Human Development Reports, (annual report). <https://hdr.undp.org/> />
- Haughton, J.; Khandker, S.R. (2009) Handbook on poverty and inequality. Washington, DC: World Bank. © World Bank. ISBN: 978-0821376133. License: CC BY 3.0 IGO.

- <https://openknowledge.worldbank.org/entities/publication/159a4bae-4817-5b0b-9d7f-9ba7b6b666cb> />
- Kates, R.W., ed. (2010), Readings in sustainability science and technology - an introduction to the key literature of sustainability science, CID Working Paper No. 213. Center for International Development, Harvard University. <https://www.rwkates.org/pdfs/a2010.02.pdf> />
 - Monitoring global poverty: report of the commission on global poverty. The World Bank. ISBN: 978-1464809620. DOI: 10.1596/978-1-4648-0961-3. <https://openknowledge.worldbank.org/server/api/core/bitstreams/00f8ca01-a0ab-5c4d-a461-e5ca60af5261/content> />
 - EUROSTAT. <https://ec.europa.eu/eurostat/data/database> />
 - FAOSTAT (Food and agriculture data). <https://www.fao.org/faostat/en/#home> />
 - GAPMINDER. [https://www.gapminder.org/tools/#\\$chart-type=bubbles](https://www.gapminder.org/tools/#$chart-type=bubbles) />
 - IEA (International Energy Agency). <https://www.iea.org/data-and-statistics> />
 - IMF Data (IMF - International Monetary Fund). <https://www.imf.org/en/Data> />
 - UN DESA (United Nations. Department of Economic and Social Affairs). <https://unstats.un.org/UNSDWebsite/> />
 - UN ODS (United Nations. Objetivos de Desarrollo Sostenible). <https://www.un.org/sustainabledevelopment/es/objetivos-de-desarrollo-sostenible/> />
 - WRI (World Resources Institute). <https://www.wri.org/data> />
 - WB (World Bank). <https://data.worldbank.org/> />