

Course guide

480USE009 - 480USE009 - Climate Change and International Policies

Last modified: 15/06/2026

Unit in charge: Barcelona School of Civil Engineering

Teaching unit: 748 - FIS - Department of Physics.

717 - DEGD - Department of Engineering Graphics and Design.

Degree: MASTER'S DEGREE IN SUSTAINABILITY AND STRATEGIES FOR A JUST GLOBAL TRANSITION (Syllabus 2026). (Optional subject).

Academic year: 2026

ECTS Credits: 5.0

Languages: Spanish

LECTURER

Coordinating lecturer: Alcaraz Sendra, Olga

Others: Sureda Carbonell, Barbara
Alcaraz Sendra, Olga

TEACHING METHODOLOGY

MD.1.- Active expository teaching (participatory lecture).

MD.3.- Problem-based learning (PBL).

MD.4.- Case studies.

MD.7.- Project-based learning.

LEARNING OBJECTIVES OF THE SUBJECT

Understand the physical mechanisms of climate change (greenhouse effect and carbon cycle) and analyze the relationship between the scientific bases of climate change and its impacts on natural and human systems, identifying the main socio-ecological conflicts and the vulnerabilities derived from them.

Apply quantitative methodologies (such as the Kaya Identity and the Carbon Budget) and modeling techniques to evaluate historical emission trajectories and project future scenarios that allow informed decision-making in sustainability matters.

Plan and evaluate sectoral mitigation and adaptation strategies, using climate policy simulators to achieve decarbonization goals and strengthen the resilience of ecosystems and societies.

Interpret the evolution of the multilateral climate architecture (from the UNFCCC, Kyoto to the Paris Agreement), integrating the principles of equity, climate finance, and social justice as central axes in policy negotiation and implementation.

STUDY LOAD

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

Total learning time: 125.1 h

CONTENTS

title english

Description:

The Earth's atmosphere and the greenhouse effect. The carbon cycle.

The intensification of the greenhouse effect of anthropogenic origin and its interference with the carbon cycle.

Radiative forcing; greenhouse gases (GHGs) and their global warming potential (GWP). The aggregate effect of GHGs in terms of CO₂eq.

The evidence of climate change, according to the latest IPCC reports: a) from the perspective of the analysis of historical correlations of relevant data; b) from the perspective of its effects.

Related activities:

Calculation of CO₂ equivalent emissions

Analysis of climate change tipping points

Full-or-part-time: 6h

Theory classes: 6h

Energy, economy, and anthropogenic driving factors

Description:

The great acceleration, an anthropogenic phenomenon resulting from a specific economic-energy-agrifood model.

Variation in emissions and GHG concentrations, orders of magnitude.

The differentiated historical responsibilities of developing countries vs developed countries and the different capacity of these countries to undertake mitigation and/or adaptation policies.

Driving factors of anthropogenic climate change, the Kaya identity. Methodology for creating future CO₂ emission scenarios.

The contribution of different sectors to climate change at global and regional levels.

Related activities:

TP1: Determination and analysis of the primary energy vector of different countries, and calculation of the associated CO₂ emissions.

TP2: Development of future scenarios for the energy vector of different countries, and calculation of the associated CO₂ emissions.

TP3: The Kaya identity. Analysis of the evolution of historical CO₂ emissions based on variations in carbon intensity, energy intensity, GDP per capita, and population.

TP4: Construction of evolution scenarios for future emissions by acting on the driving factors of the Kaya identity.

Full-or-part-time: 9h

Theory classes: 9h

The political agenda of the fight against climate change

Description:

International summits to combat climate change; a bit of history: from Rio 92 to Paris 2015 and up to the present

The UNFCCC: structure and functioning; contents, principles, and commitments; the annexes of the UNFCCC.

The Kyoto Protocol.

The failure of the Copenhagen summit and the promises of the Cancún summit.

The Durban Platform and the path towards Paris 2015.

Full-or-part-time: 6h

Theory classes: 6h

The Paris Agreement and the future

Description:

The Paris Agreement (PA): structure, critical analysis of the mitigation component of the PA: Nationally Determined Contributions (NDCs), the global stocktake, long-term low-emission development strategies (LTLEDS), the new enhanced transparency framework, ...

The PA rulebook (Paris Rulebook).

Where are we and where are we going?

Specific objectives:

TP5: Mitigation policy simulator "En-Roads"

Full-or-part-time: 9h

Theory classes: 9h

The latest IPCC reports

Description:

The IPCC and global mitigation goals.

The future scenarios of the IPCC AR6, the "Shared Socio-economic Pathways (SSPs)"

The concept of Global Carbon Budget.

Full-or-part-time: 6h

Theory classes: 6h

GRADING SYSTEM

AV1 Knowledge control test. 30%

AV2 Active participation in class work. 10%

AV3 Practical works (TP) carried out throughout the course. 60%

Final grade (Nf): $0.30AV1 + 0.10AV2 + 0.60AV3$

EXAMINATION RULES.

AV1. There will be a final exam (FE), with a maximum duration of 2 hours, which will consist of questions related to theoretical and practical knowledge of the subject syllabus and aimed at assessing the learning objectives achieved by the student.

AV2. Participation and attendance in class will be evaluated.

AV3. The 6 practical works (TP) of the subject will be evaluated through the review of the submitted material and the class presentation that the students will make.

BIBLIOGRAPHY

Basic:

- IPCC. 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 [on line]. Geneva, Switzerland: IPCC, 2023 [Consultation: 10/06/2026]. Available on: https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_FullVolume.pdf. ISBN 978-92-9169-164-7 .

- IPCC. Summary for Policymakers. In: Global Warming of 1.5°C [on line]. Cambridge, UK and New York, NY, USA: Cambridge University Press, 2018 [Consultation: 10/06/2026]. Available on: https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SPM_version_report_LR.pdf.

RESOURCES

Other resources:



Class material available on ATENEA

Glossaries:

- UNFCCC.- Glossary of climate change acronyms and terms: https://unfccc.int/resource/cd_roms/na1/ghg_inventories/english/8_glossary/Glossary.htm />• UNEP.- Glossary of terms for negotiators of multilateral environmental agreements: <https://www.unenvironment.org/resources/report/glossary-terms-negotiators-multilateral-environmental-agreements> />

Databases:

- World Bank: <http://data.worldbank.org/>
- UN: <http://data.un.org/> (UN data)
- IEA: <https://www.iea.org/data-and-statistics> />• IEA, Energy Statistics Data Browser: <https://www.iea.org/data-and-statistics/data-tools/energy-statistics-data-browser> />• IEA, Sankey diagrams: <https://www.iea.org/data-and-statistics/data-tools/energy-sankey> (IEA: Sankey diagrams)
- Climate Watch: <https://www.climatewatchdata.org/data-explorer/> />• NOAA: <http://www.noaa.gov/>
- UNFCCC: http://unfccc.int/ghg_data/items/3800.php