

Environmental Sciences (I002439)

Course size *(nominal values; actual values may depend on programme)*

Credits 4.0

Study time 120 h

Course offerings and teaching methods in academic year 2025-2026

A (semester 1)

Dutch

Gent

seminar

lecture

excursion

Lecturers in academic year 2025-2026

Derycke, Anja

LA20

staff member

De Smedt, Philippe

LA20

lecturer-in-charge

Verheyen, Kris

LA20

co-lecturer

Offered in the following programmes in 2025-2026

[Bachelor of Science in Bioscience Engineering](#)

crdts

4

offering

A

Teaching languages

Dutch

Keywords

Landscape-forming processes; (Inter-)Glacials; Holocene; Critical Zone; Soil science; Anthropocene, Planetary boundaries; Global change; Sustainable development.

Position of the course

This course unit aims to give students an understanding of the broad outlines that define the interaction between humans and the environment. Building further on the course 'Earth Sciences', a first section starts from the formation of the 'Critical Zone', which integrates shallow geology, soil, water, air, and living organisms. Here, landscape-forming processes are highlighted, with particular attention to the role of Quaternary climate fluctuations and their impact on the environment independent of human influences. As an extension of this, the formation processes of soils are discussed, along with their classification. Due to the key role of soils within the 'Critical Zone', and their defining role in various ecosystems (plant, animal, human), the nature, occurrence, and function of soils is explored in depth. Here the link is made to the human ecosystem. A bridge is thus created with a second part of the course, in which the concepts of Anthropocene and Planetary Frontiers are explained. Then, each planetary boundary (climate change, land use change, biodiversity loss, etc.) is explained in detail following a fixed pattern: what is the problem? How is the respective planetary boundary determined? What are the uncertainties, knowledge gaps and points of criticism? Finally, we will demonstrate - succinctly - how these insights lead to new concepts of sustainable development.

Contents

Part I – Genesis, role, and inventorisation of the 'Critical Zone'

- 1 landscape formation in a changing environment - genesis of the 'Critical Zone'
- 2 Soil as a key component of the Critical Zone
- 3 Inventorisation of the Critical Zone

Part II – Planetary Boundaries

- 1 Anthropocene
- 2 Planetary boundaries
- 3 Sustainable development

Initial competences

Environmental Sciences builds on certain learning outcomes of course units 'Earth Sciences' and 'Ecology'; or the learning outcomes have been achieved differently.

Final competences

- 1 Be able to interpret the essential landscape-forming processes and climatic changes during the end of the Quaternary (Late Glacial) and Early Holocene.
- 2 Understanding the role of the Critical Zone in availability of life support resources, with emphasis on soil functions.
- 3 Have basic understanding of key soil processes and their impact on human ecosystems.
- 4 Have knowledge of the most common environmental inventory methods, and their importance in environmental studies.
- 5 Be able to retrieve and consult publicly available environmental information.
- 6 Understand the concepts 'Anthropocene' and 'Planetary boundaries'.
- 7 Understanding the nature, quantification and uncertainties of the respective planetary boundaries.
- 8 Understanding concepts of sustainable development based on planetary boundaries.
- 9 Understanding concepts of sustainable development based on planetary boundaries.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Excursion, Lecture

Extra information on the teaching methods

lecture: classes supported by slides;
excursion: one-day excursion (landscape visit + landscape study);
flipped classroom and peer evaluation

Study material

Type: Syllabus

Name: Online syllabus part I

Indicative price: Free or paid by faculty

Optional: no

Type: Slides

Name: class slides

Indicative price: Free or paid by faculty

Optional: no

References

Roberts, Neil. *The Holocene: An Environmental History*. Vol. 3rd volume. Oxford: Wiley & Sons, 2014. Hoofdstukken 1, 2, 3.
Nortcliff, Winfried Blum; Peter Schad; Stephen. *Essentials of Soil Science*. Stuttgart, Germany: Schweizerbart Science Publishers, 2017. (Hoofdstukken 1, 2, 5, 6)
Weil, R.R., and N.C. Brady. *The Nature and Properties of Soils, Global Edition*. 15th ed. Pearson Education, 2016. (Hoofdstukken 1)
Lewis, S.L. & Maslin, M.A. 2015. Defining the Anthropocene. *Nature* 519: 171-180.
Steffen, W. et al. (2015). Planetary boundaries: guiding human development on a changing planet. *Science* 347:736 (+ SI).
Folke, C. et al. (2016). Socio-ecological resilience and biosphere-based sustainability science. *Ecology and Society* 21(3): 41.

Course content-related study coaching

Restricted question raising before or after each lecture. Individual (extended questions): after appointment. Support through Ufora (forum for students).
Organizational communications will go through Ufora.

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment with open-ended questions

Examination methods in case of periodic assessment during the second examination period

Written assessment with open-ended questions

Examination methods in case of permanent assessment

Presentation, Peer and/or self assessment, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

Non-periodic evaluation (NPE) includes group work and presentation, coupled with peer evaluation.

Calculation of the examination mark

The NPE-score accounts for 20%, the end-of-term assessment accounts for 80% of the final mark.