

The Limits to Growth: Sustainability and the Circular Economy

Lecture 0: Organization

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M.Sc. Anant Sujatanagarjuna
M.Sc. Chintan Patel

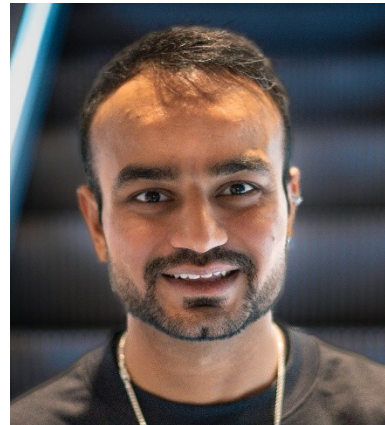
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- Updated versions of these slides will be available in our [Github repository](#).

Team



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Research Group

- **Emerging Technologies for the Circular Economy → ETCE**
- Research focus:
 - Intersection of IT and sustainability
 - Circular Economy
 - Self-organized, decentralized and distributed systems
 - Machine-to-Everything Economy (M2X Economy)
- Other courses:
 - Requirements Engineering (WS – M.Sc.)
 - Emerging Technologies for the Circular Economy (SS – M.Sc.)

Research Group

- ETCE Website – [Link](#)
 - Course material
 - Theses/project topics

- Our research in action:
 - ZDF documentary (German) – [Link](#)
 - Klartext Preis 2020 (German) – [Link](#)

Research Group

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 - Course material
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- Our research in action:
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You want join us? Write us an email!

→ benjamin.leiding@tu-clausthal.de



THE COURSE

Course Content

- Basics of climate change, environmental pollution, and dwindling non-renewable resources
- Introduction to the circular economy, sustainability, and related concepts (biocapacity, etc.)
- Sustainability goals
- Feedback loops and tipping points
- Implications of closed systems with a finite supply of resources
- Technology-focused and technology-critical approaches towards sustainability
- Circular Societies

Learning Outcome

- Understanding the concept of a circular economy, sustainability, and related concepts (biocapacity, etc.).
- Gain a basic understanding of causes, dimensions, and the characterization of climate change, environmental pollution, and dwindling non-renewable resources.
- Being able to make high-level, transdisciplinary assessments of decisions and measures in a social, economic, and political context.
- The ability to critically assess upcoming technological solutions enabling/facilitating sustainability and the circular economy.

Lectures

Date	Lecture Title
06.11.2025	L00 – Organisation & L01 – Introduction
13.11.2025	L02 – Challenges I – Environmental Pollution and Resource Scarcity
20.11.2025	L03 – Challenges II – Climate Change L04 – <i>Limits to Growth & Planetary Boundaries</i> (MOOC - Homework)
27.11.2025	L05 – Invited Lecture (Ani Melkonyan-Gottschalk) – Circular Economy (CE) L06 – <i>A Short History of Political (In-) Action</i> (MOOC - Homework)
04.12.2025	L07 – Circular Societies (MOOC@Home)
11.12.2025	L08 – Invited Lecture (Johannes Müller-Salo) – Ethics & Moral of Sustainability L09 – <i>Life Cycle Assessment (LCA)</i> (MOOC - Homework)
18.12.2025	L10 – Invited Lecture (David Inkermann) – Life Cycle Planning of Durable Products (MOOC@Home)
08.01.2026	L11 – Complex Societies and Technology
15.01.2026	L12 – Beyond the Circular Economy
22.01.2026	L13 – Invited Lecture (Roland Menges) – The Common Good and Collective Decision-Making
29.01.2026	Group Presentations and Lessons Learned
05.02.2026	L14 – Invited Lecture (Gabriel Busato CatFarm)
12.02.2026	L15 – Summary
19.02.2026	Exam Q&A

MOOC == Watch@Home

Exercises

Publication Date	Submission Deadline	Exercise
06.11.2025	13.11.2025	E00 – Who are you?
13.11.2025	20.11.2025	E01 – Ecological Footprint
20.11.2025	27.11.2025	E02 – Household Waste
11.12.2025	18.12.2025	E03 – Der Verein (Group Exercise)
18.12.2025	08.01.2026	E04 – Protest Manifesto (Group Exercise)
15.01.2026	22.01.2026	E05 – Circular Societies (Group Exercise)

Course Organization

- Course website - [Link](#)
- News and updates:
 - All updates will be communicated through the university email
 - CLZ students + DigiTec will additionally receive information via StudIP ([Link](#))
- Slides will be uploaded to Github ([Link](#)) → Please report bugs ;)
- Lecture recordings will be available on StudIP and on Github
- Questions? Write us an email: etce-ltg@tu-clausthal.de ← **We will only respond to emails written to this specific email address!**



Course Organization - Asynchronous Learning & MOOC content

- **Massive Open Online Course**
 - Remote and (often) asynchronous online courses *not* just for students enrolled in a specific university, but *ideally* open for everybody
 - Usually consist of pre-recorded lectures, interactive content and online quizzes
 - Some of you might have visited MOOC on platforms such as edX, LinkedIn Learning, Coursera, Udacity, etc. before
- We are currently developing a MOOC for the Limits to Growth Lecture
- This semester will be another test run for this asynchronous and digital learning content
 - We are very happy about any feedback you can give us to improve the course further! Just write us an email: etce-ltg@tu-clausthal.de

Course Organization - Asynchronous Learning

- This semester includes asynchronous learning content for some of the lectures
 - Consisting of short pre-recorded videos and interactive content
- You will get further information about these two sessions during the semester
 - You will find the lecture videos on the course website

20.11.2025

L04 - Limits to Growth & Planetary Boundaries (**Flipped Classroom** → [MOOC@Home](#))

27.11.2025

L06 - A Short History of Political (In-) Action (**Flipped Classroom** → [MOOC@Home](#))

11.12.2025

L09 - Life Cycle Assessment (LCA) (**Flipped Classroom** → [MOOC@Home](#))

The MOOC lectures will **not** be live lectures. Instead, you will find pre-recorded videos and other content on our website.

Dates/Times/Locations

- Lecture:
 - Thursday **2:00 pm to 3:30 pm** (Berlin time) – 06.11.2025 to 12.02.2026
 - Location: Goslar Gotec (Am Stollen 19 C, 38640 Goslar, Germany) or via BigBlueButton ([Link](#))
- Exercise / Q&A:
 - Thursday **3:45 pm to 4:40 pm** (Berlin time) – 06.11.2025 to 12.02.2026
 - Location: Goslar Gotec (Am Stollen 19 C, 38640 Goslar, Germany) or via BigBlueButton ([Link](#))

EXERCISES

Exercises

- Individual work + group submissions
- Submission of **each** exercise is **mandatory**
- You pass by submitting an exercise with proper filename – even if it is an empty
- You will receive feedback on your submission
- Exercise = learning feedback

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- Submission of **each** exercise is **mandatory**
- You pass by submitting an exercise with proper filename – even if it is an empty
- You will receive feedback on your submission
- Exercise = learning feedback

Some exercises require you to submit your work. All such exercises should be submitted through the link in exercise sheet, using the password “Limitstogrowth2526”:

- We do not accept email submissions; please use the file drop link mentioned in exercise sheet to upload your submissions.
- **Important:** Always submit the exercise sheet with correct filename for example,
→ *E01-Firstname.pdf*

Exercises

- Interactive PDF for each exercise.
- Answers to be filled in exercise PDF sheet itself.
- For Group submission(s) we strongly encourage you to use Q&A sessions to discuss and develop your ideas.

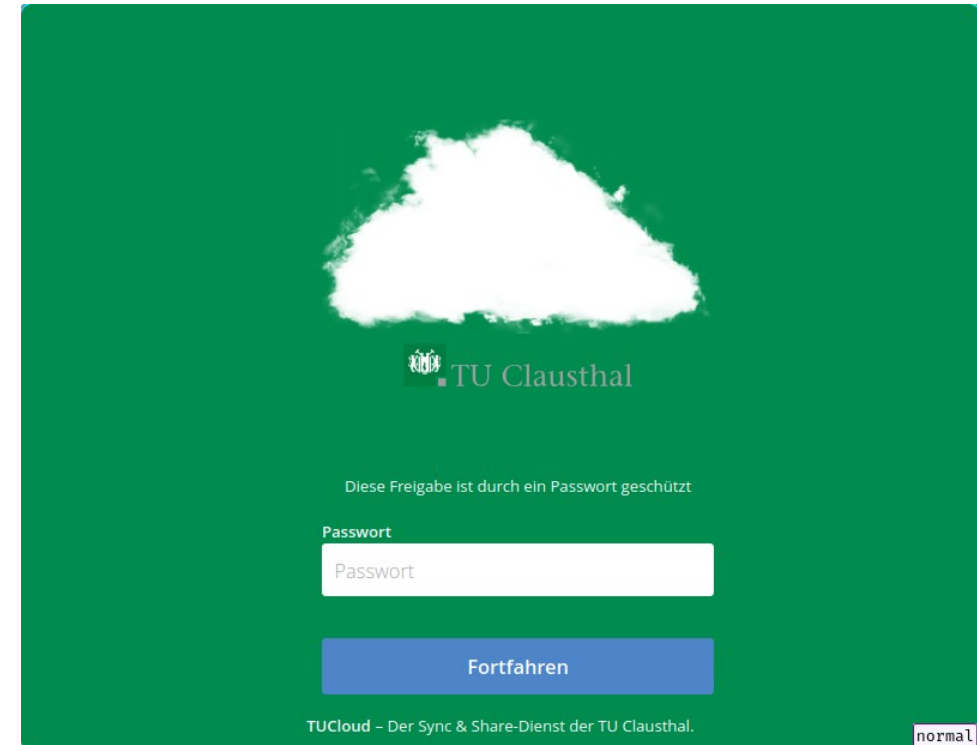
Exercises

Submission Instructions

- Step 1: Find the link in the exercise PDF files.

Each exercise has a unique link to submission folder, which looks like this -->

- Step 2: Enter the password
'Limitstogrowth2526'



Exercises

Submission Instructions

- Step 3: Upload a file, e.g. “E01-Firstname.pdf”
 - Once you upload a file, you cannot delete it
 - Unless otherwise specified, we only accept PDF or mp4 files.
 - Ensure that your full name (Individual exercises) or Group name (Group exercise), and the exercise is mentioned in the filename.



Anonymes Hochladen

↑ Dateien auswählen oder Datei zum Hochladen
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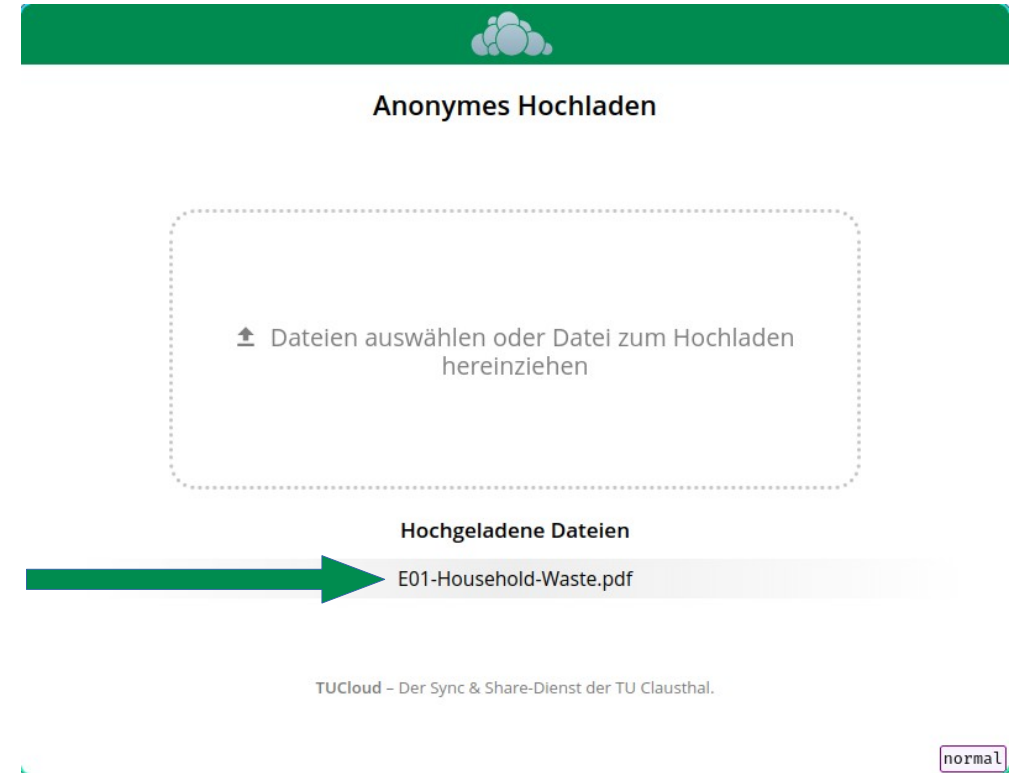
TUCloud – Der Sync & Share-Dienst der TU Clausthal.

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Exercises

Submission Instructions

- Step 4: If your exercise was successfully uploaded, it will be visible. Please do not upload duplicates.



Bonus Exercises

- Simple and facile, sometimes also fun
- Not mandatory
- All student / Groups will have advantage in Exam for bonus task(s)
 - Submit all bonus task(s) to gain points
 - Eligible students will have a chance to skip **ONE** question in exam without adversely affecting final grading

EXAMINATION

Examination

- Prerequisite for admission to the final exam (all criteria have to be fulfilled):
 - Submit all exercises
- **Final exam:**
 - **Most likely on the 04.03.26 - 06.03.26**
 - Either written exam (120min) **or** oral examination (20-25min)

Examination

- Prerequisite for admission to the final exam (all criteria have to be fulfilled):
 - Submit all exercises
- **Final exam:**
 - **Most likely on the 04.03.26 - 06.03.26**
 - Either written exam (120min) **or** oral examination (20min)
- **Note for external students** → You do not have to register as a guest student at TU Clausthal! You pass the exam and get a written confirmation from us which you can present to your local examination office.

FINAL NOTES

Self-Study Star

Self-Study Star → 

- Slides with the self-study star indicate optional/additional study material that is **not** mandatory but could be helpful or interesting

Literature

- This course is not based on a single book and you **do not** need to buy a book to pass the exam.
- Donella H. Meadows, Jorgen Randers, and Dennis L. Meadows. *The Limits to Growth* (1972).
- Donella H. Meadows, Jorgen Randers, and Dennis L. Meadows. *Limits To Growth: The 30-Year Update* (2004).
- Baccini et al. *Metabolism of the Anthroposphere: Analysis, Evaluation, Design* (2012).
- Walter R. Stahel. *The Circular Economy: A User's Guide* (2019).
- W. Brian Arthur. *The Nature of Technology: What It Is and How it Evolves* (2011).
- David Wallace-Wells. *The Uninhabitable Earth, Annotated Edition* (2017).
- James Lawrence Powell. *The 2084 Report: An Oral History of the Great Warming* (2020).
- Joseph Tainter. *The Collapse of Complex Societies* (1988).

Literature

- (German) Stefan Rahmstorf, Hans Joachim Schellnhuber. *Der Klimawandel* (2019).
- David Archer, Stefan Rahmstorf. *The Climate Crisis* (2010).
- Gabrielle Walker, David King. *The Hot Topic: How to Tackle Global Warming and Still Keep the Lights on* (2008).



Questions?