Valid from 2024.HS

Module description: Life Cycle Sustainability Assessment

Module Code	w.MA.XX.LCSA.23HS
ECTS Credits	3
Language of Instruction/Examination	English
Module Description	Environmental sustainability is the practice of using natural resources like water, soil, or air responsibly so they can support both present and future generations. United Nations Sustainable Development Goal (SDG) 12 targets “responsible consumption and production” by reducing the ecological footprint of products, services, and consumption patterns. Beyond that, social and economic sustainability goals aim to achieve, e.g., respect for human rights along value chains or sustained economic growth. Scientifically valid life-cycle-based information is crucial in order to implement sustainability strategies successfully. Life cycle assessment (LCA) is a helpful tool for aligning decisions with ecological criteria and reducing environmental impacts. This module covers LCA and related topics, including life cycle thinking, life cycle inventory modeling, and life cycle impact assessment from an environmental perspective. Other topics include the social and economic life-cycle perspective wit social LCA and life cycle costing (LCC). In groups, students will apply life cycle thinking and LCA methods to specific problems. The module enables students to transfer insights from applied science to industry and society through life cycle thinking and life cycle management. Students will learn how to identify and develop effective sustainability measures that contribute to the global SDGs.
Organizational Unit	CCR Ltg.
Module Coordinator	Matthias Stucki
Deputy Module Coordinator	Corinna Baumgartner
Program and Specialization	• Circular Economy Management
Legal Framework	Academic Regulations MSc in Circular Economy Management dated 02.06.2022, Appendix to the Academic Regulations for the degree program in Circular Economy Management, first adopted on 23.09.2022
Module Category	**Module Type** Compulsory
Prerequisite Knowledge	Students should be able to: • explain the drivers, mechanisms, and impacts of major environmental issues such as climate change, eutrophication, resource depletion, deforestation, etc. • elaborate on the sustainable development goals of the United Nations. • read, process, and critically discuss scientific publications from peer-reviewed journals, • understand the basics of systems theory, life cycle thinking, economics and chemistry, and • perform calculations and visualizations in MS Excel.
Contribution to Program Learning Objectives (by the concerned Module)	• Professional Competence • Methodological Competence • Social Competence • Self-Competence

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Contribution to Program Learning Objectives

Professional Competence
- Knowing and Understanding Content of Theoretical and Practical Relevance
- Apply, Analyze, and Synthesize Content of Theoretical and Practical Relevance
- Evaluate Content of Theoretical and Practical Relevance

Methodological Competence
- Problem-Solving & Critical Thinking
- Scientific Methodology
- Work Methods, Techniques, and Procedures
- Information Literacy
- Creativity & Innovation

Social Competence
- Written Communication
- Oral Communication
- Teamwork & Conflict Management
- Intercultural Insight & Ability to Change Perspective

Self-Competence
- Self-Management & Self-Reflection
- Ethical & Social Responsibility
- Learning & Change

Module Learning Objectives

Students...
- will explain the basic structure of LCA
- will defend the purpose and scope of the application of different methods of environmental/sustainability analysis
- will identify the environmental hotspots in the life cycle of products using LCA software.
- will quantify and assess sustainability impacts using life-cycle-based approaches.
- will analyze processes in complex value chains using systemic life cycle thinking approaches.

Module Content
- Life Cycle Thinking – The Game.
- Cradle to grave / cradle to cradle.
- Life cycle inventory modelling.
- The allocation challenge: Which life cycle is responsible for environmental impacts?
- Life cycle impact assessment.
- Aggregation of environmental impacts in a single score - ecological scarcity method.
- LCA modelling with software.
- Social LCA
- Life cycle costing
- Life cycle sustainability assessment

Links to other modules

This module is linked to the following modules:

Digital Learning Resources
- Teaching Videos
- Teaching Materials

Methods of Instruction
- Exercises
- Case Studies
- Project Work
- Lecture

Social Settings Used:
- Group Work

Type of Instruction

	Classroom Instruction	Guided Self-Study	Autonomous Self-Study
Lecture	18 h	-	
Excercise	6 h	6 h	
Project Work	4 h	30 h	
Seminar	-	-	
Total	**28 h**	**36 h**	**26 h**

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Performance Assessment

End-of-module exam	Form	Length (min.)	Weighting
-			
Permitted Resources			

Others	Assessment	Format	Length (min.)	Weighting
Written Assignment	Grade	Gruppenarbeit	0	100.00
Written Assignment	Pass/Fail	Einzelarbeit	0	0.00
Talk/oral presentation	Pass/Fail	Gruppenarbeit	10	0.00

Classroom Attendance Requirement

80%

Compulsary attendance requirement for first and last lecture of the module as well as specific events as communicated on the first day of the module.

Compulsory Reading

- Backes, J. G., & Traverso, M. (2022). Life cycle sustainability assessment as a metrics towards SDGs agenda 2030. Current Opinion in Green and Sustainable Chemistry, 38, 100683. https://doi.org/10.1016/j.cogsc.2022.100683
- Sala, S., & Castellani, V. (2019). The consumer footprint: Monitoring sustainable development goal 12 with process-based life cycle assessment. Journal of Cleaner Production, 240, 118050. https://doi.org/10.1016/j.jclepro.2019.118050
- Stucki M. & Kröhnert H. (2022) Preparation material - Life Cycle Sustainability Assessment (PDF). Zurich University of Applied Sciences. Wädenswil

Recommended Reading

- ISO. (2006a). Environmental management - Life cycle assessment - Principles and framework. ISO 14040:2006; International Organization for Standardization (ISO); Geneva.
- ISO. (2006b). Environmental management - Life cycle assessment - Requirements and guidelines. ISO 14044:2006. International Organization for Standardization (ISO); Geneva.

Comments