

CIVE230 – Engineering and Sustainable Development

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WATERLOO | ENGINEERING



UNIVERSITY OF
WATERLOO

Department of Civil and
Environmental Engineering

2 Student Groups

126 CIVE (2nd Year)

21 MGTE (4th Year)

CIVE 230 teaches sustainability both **qualitatively and quantitatively**.



Assignment Structure

Qualitative theory and discussion questions

Quantitative practice problems

CIVE 230 Engineering and Sustainable Development

Assignment 5

Life Cycle Assessment & Sustainable Cities and Sustainability Assessments

(Total marks: 50)

(due Friday, July 17 2020 at 11:59pm on Crowdmark)

Theory (Total: 15 marks)

Question 1. Life Cycle Assessment (LCA) is useful for decision-making, learning/exploring, and communication. Give an example of how these LCA applications help guide more sustainable choices. (4 marks)

Question 2. Referring to the lecture examples (from Masters and Ela, 2008) on single-use cups and soft drink containers, what decision would you make regarding the better alternative in each of the two cases? There's no right answer, only a good rationale for justification. (5 marks)

Question 3. In your own words, describe the concept of "planetary boundaries" and refer to the author credited with this idea. (3 marks)

Question 4. What does Scope 1, 2, and 3 refer to in a greenhouse gas emissions inventory? (3 marks)

Practice Problems (35 marks)

Question 5. This practice problem will get you to explore a Life Cycle Assessment study for a product of your choice, based on existing research that you can find online. (10 marks)

1. Identify an LCA study from a credible source of information and reference your source.
2. Determine the goal of the study (why the LCA was conducted?)
3. Review the LCA study.

Draw a flowchart for the Life Cycle Assessment Framework as shown in Module 9b that is specific to the product you have researched, this includes identifying the goal of the study; boundaries of the study (start and end points); life cycle inventory of materials, energy, other inputs and outputs; life cycle impacts; life cycle improvements; and the interpretation of results/conclusions.

Draw a flowchart for the Life Cycle Assessment as shown in Module 9a for the product showing the life cycle stages; inputs and outputs; potential impacts, and potential opportunities for reuse, remanufacture and recycling.

The grading for this question is based on how well the flowcharts are contextualized to the product you are researching, and the level of detail.

Weekly Checklist

Spring 2020 – CIVE 230: Engineering and Sustainable Development

Module 5: Water Resources and Water Scarcity Issues

Introduction

The quality of our life very much depends on the sustainability of our water resources, as such, the sustainability of water resources requires a look at both the quantity and quality of water. This module looks at the “quantity” part of water, by exploring water availability and scarcity globally. An understanding of the hydrologic cycles puts in perspective all our water resources, and an understanding of the biogeochemical cycle highlights pathways of substances through air, water and land. This module introduces the water budget equation, and tracks water use in society by analyzing the water footprint and tapping into the meaning behind virtual water.

Learning Outcomes

By the end of this week, you will be able to:

- Analyze global trends of water resources by mapping water availability and scarcity
- Review the hydrologic cycle
- Locate water resources and human influence on the natural water cycle
- Define very briefly the biogeochemical cycle to identify the magnitude of water repositories and residence times
- Explain the parameters of the water budget equation
- Determine the objectives for sustainable water resources and uses
- Track water use in society
- Define virtual water
- Interpret the water footprint of products

Required Readings

None.

Content

- Module 5 Instructor Slides (44 slides)
- Module 5a – The Quantity of Water (30:39 minutes)
- Module 5b – Sustainable Water Resources and Uses (23:44 minutes)

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Spring 2020 – CIVE 230: Engineering and Sustainable Development

Coursework



- Assignment 3:
 - Posted this week
 - To be submitted on Crowdmark by Friday June 19 @11:59pm EST (not considered late until June 21 @11:59pm EST)
- Sustainability Contribution:
 - Applicable in Week 5 to students with Student IDs ending in 2
 - To be submitted on LEARN Dropbox by June 12 @11:59pm

Optional Readings and Resources

Videos:



Our Thirsty World by National Geographic. Retrieved from:
<https://www.youtube.com/watch?v=2pXuAw1bSQo> (3:28 minutes)



The Future of Water by Quartz. Retrieved from:
<https://www.youtube.com/watch?v=4URapRHxsmE> (10:10 minutes)



Water Changes Everything by CharityWater. Retrieved from:
<https://www.youtube.com/watch?v=BCHhwvQxg> (3:23 minutes)



First City to Run Out of Water? The Cape Town Water Crisis by AJ+. Retrieved from:
<https://www.youtube.com/watch?v=hg6cwc19Rw> (10:29 minutes)

Book Chapters:

Kabbes, K., Reichenberger, J., Briggs, C., Davidson, C., and Perks, A., (2017). [Chapter 16: Water Resources: Sustaining Quality and Quantity](#), in in Engineering for Sustainable Communities – Principles and Practices by Kelly, W. E., Luke, B.; Wright, R. (eds), American Society of Civil Engineers (ASCE). Retrieved from: <https://app.knovel.com/hotlink/toc/id:kpESCPP004/engineering-sustainable/engineering-sustainable>



Module 6: Water Pollution and Methods to Improve Water Quality