Rutgers University
Department of Environmental Sciences

16:375:534 ENVIRONMENTAL SUSTAINABILITY: LIFE-CYCLE ASSESSMENT TOOLS

Description: Theory of analytical tools to assess environmental sustainability of goods and services including sustainability metrics; material flow analysis; SETAC-EPA life-cycle assessment (LCA), Economic Input-Output life-cycle assessment and benefit-cost analysis. Application of LCA to real-world problems.

Instructor: Dr. Uta Krogmann
Department of Environmental Sciences
ENR Building, 14 College Farm Road, Room 246
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Schedule: Tuesday/Friday 10:55 am -12:15 pm
ENR 323

Textbook:

Schenck, R. and White, P. (Eds.). (2014). Environmental Life-Cycle Assessment. Measuring the Environmental Performance of Products. American Center for Life-Cycle Assessment, Vashon Island, Wa.

References (Some references are posted on Sakai)**:**

Baccini, P., & Brunner, P. H. (2012). *Metabolism of the Anthroposphere: Analysis, Evaluation, Design*. MIT Press, Cambridge, MA.

Baumann, H. and Tillman, A.-M. (2004). *The Hitch Hiker's Guide to LCA*. Studenttliteratur AB, Lund, Sweden.

Brunner, P.H. and Rechberger, H. (2004). *Practical Handbook of Material Flow Analysis*. Lewis Publishers, CRC Press LLC, Boca Raton, FL.

Heijungs, R., & Suh, S. (2002). *The Computational Structure of Life Cycle Assessment* (Vol. 11). Springer Science & Business Media, New York, NY.

Hendrickson, C.T., Lave, L.B.and Matthews, H.S. (2006). *Environmental Life Cycle Assessment of Goods and Services: an Input-Output Approach*. Resources for the Future, Washington, DC.

ISO 14040. 2006. Environmental Management – Life Cycle Assessment – Principles and Framework. International Organization for Standardization, Geneva, Switzerland.

ISO 14044. 2006. Environmental Management – Life Cycle Assessment – Requirements and Guidelines. International Organization for Standardization, Geneva, Switzerland.

European Commission - Joint Research Centre – Institute for Environment and Sustainability (2010). *International Reference Life Cycle Data System (ILCD) Handbook – General Guide for Life Cycle Assessment – Detailed Guidance*. Ispra, Italy.

SAIC (2006). *Life Cycle Assessment: Principles and Practice*. Report EPA/600/R-06/060. US EPA, Cincinnati, OH.

Schedule (Chapters refer to textbook):

1. Introduction (Chapt.1)
2. ISO standards and unit processes (Chapt. 2 and 4)
3. Life-cycle inventory (Chapt. 5)
4. Data quality, attributional versus consequential LCA, allocation and material recycling (Chapt. 6 and 8)
5. Working with SimaPro
6. Major environmental issues (Chapt. 9)
7. Impact assessment and modeling (Chapt. 10)
8. Life cycle impact assessment (Chapt. 11)
9. Working with SimaPro
10. Global Warming – Presentation by guest speaker
11. Energy consumption and its environmental impacts – Presentation by guest speaker
12. Work on final project
13. Decision support calculations (Chapt. 12)
14. Interpretation of results and their communication (Chapt. 13 and 18)
15. Critical review of LCA articles (Student presentations)
16. Work on final project
17. Critical review of LCA articles (Student presentations)
18. Bias and uncertainty in LCA (Chapt. 14 and 15)
19. Input-Output models for life-cycle assessment (Chapt. 7)
20. Work on final project
21. Life cycle environmental impacts of green vs conventional buildings – Presentation by guest speaker
22. Eco-efficiency analysis – Presentation by guest speaker
23. Carbon and water footprinting
24. Work on final project
25. Material Flow Analysis
26. Work on final project
27. Final project presentations
28. Final project presentations

Notes:

1. Bring your laptop to each class. If you do not have a laptop, please contact the instructor immediately.
2. Check your e-mail regularly for important notices about the course. Class notes and resources will be available on Sakai.
3. Office hours for help with SimaPro will be announced.
4. Final grade determination
   Homework assignments - 15%
   One take-home exam - 20%
   Presentation of critical review of LCA article – 15%
   Final group project report (incl. LCA in SimaPro 8) – 20%
   Final group project oral presentation – 20%
   Class participation – 10%

LEARNING GOALS

This class will contribute toward students' ability to:

1. develop a broad, interdisciplinary understanding of environmental processes, problems, and solutions.
2. develop the ability to effectively communicate scientific data, concepts, and problems orally and in writing, and through the production of clear and compelling graphics (figures, tables, and schematics).

(see learning goals of the Environmental Sciences Graduate Program at http://envsci.rutgers.edu/academics/envsci_grad/learning_goals.shtml)

September 1, 2015