PhD course

ADVANCED LCA - CONSEQUENTIAL AND IO-BASED LIFE CYCLE ASSESSMENT

Aalborg University, 2023

Organised by DCEA, in collaboration with the International Life Cycle Academy (ILCA)
DCEA: www.DCEA.dk/english ILCA: www.ILCA.es

Literature and reading material

1 Consequential modelling

1.1 Mandatory reading

Weidema B P, Pizzol M, Schmidt J, Thoma G (2018). Attributional or consequential Life Cycle Assessment: A matter of social responsibility. Journal of Cleaner Production 174:305–314.

Read all *theory* pages you find in the website http://consequential-lca.org/ (except the ones on the functional unit), and as many of the examples that you find necessary to understand the theory.

Weidema B P (2014). Has ISO 14040/44 failed its role as a standard for LCA? Journal of Industrial Ecology 18(3):324 326

Schmidt J, Weidema B P, Brandão M (2015). A framework for modelling indirect land use changes in life cycle assessment. Journal of Cleaner Production 99:230-238.

1.2 Optional reading

Schmidt J, De Rosa M (2020). Certified palm oil reduces greenhouse gas emissions compared to non-certified. Journal of Cleaner Production 277:124045

Weidema B P, Simas M S, Schmidt J, Pizzol M, Løkke S, Brancoli P L (2019). Relevance of attributional and consequential information for environmental product labelling. The International Journal of Life Cycle Assessment, Read only link: https://rdcu.be/bzZFn

Buyle M, Pizzol M, Audenaert A. (2018). Identifying marginal suppliers of construction materials: consistent modeling and sensitivity analysis on a Belgian case. The International Journal of Life Cycle Assessment 23(8):1624–1640.

Pizzol M, Scotti M (2017). Identifying marginal supplying countries of wood products via trade network analysis. Int. J. Life Cycle Assess. 22:1146–1158. DOI 10.1007/s11367-016-1222-6

Ghose, A., Pizzol, M., & McLaren, S. (2017). Consequential LCA modelling of building refurbishment in New Zealand: an evaluation of resource and waste management scenarios. Journal of Cleaner Production, 165, 119-133. https://doi.org//10.1016/j.jclepro.2017.07.099

Weidema B P (2017). Short procedural guideline to identify the functional unit for a product environmental footprint and to delimit the scope of product categories. 2.-0 LCA consultants, report to the Nordic Council of Ministers. http://lca-net.com/p/2527

Weidema B P (2017). Estimation of the size of error introduced into consequential models by using attributional background datasets. The International Journal of Life Cycle Assessment 22(8):1241–1246.

Brandão M, Weidema B P (2014). What can LCA learn from economics? Proceedings from the LCA XIV International Conference, October 6 8, 2014, San Francisco, CA, United States p.37 42.

Muñoz I, Schmidt J, Brandão M, Weidema B P (2014). Rebuttal to 'Indirect land use change (iLUC) within life cycle assessment (LCA) – scientific robustness and consistency with international standards'. GCB Bioenergy (2014), doi: 10.1111/gcbb.12231.

Weidema B P (2011). Ecoinvent database version 3 – the practical implications of the choice of system model. Presentation for the Life Cycle Management (LCM 2011) conference, Berlin, 2011.08.28 31.

Weidema B P, Schmidt J (2010). Avoiding allocation in life cycle assessment revisited. Column for Journal of Industrial Ecology 14(2):192 195.

2 Module

2.1 Mandatory reading

Brightway2, introduction and key concepts. https://2.docs.brightway.dev/intro.html

Henriksson PJG, Rico A, Zhang W, et al (2015) Comparison of Asian Aquaculture Products by Use of Statistically Supported Life Cycle Assessment. Environ Sci Technol 49:14176–14183. doi: 10.1021/acs.est.5b04634

Heijungs, R., Suh, S., 2002. The basic model for inventory analysis, in: Tukker, A. (Ed.), The Computational Structure of Life Cycle Assessment. Kluver Academic Publisher, London, pp. 11–28.

Saltelli A (2005) Global Sensitivity Analysis: An Introduction. Chapter in: "Sensitvity Analysis of Model Output" Kenneth M. Hanson and François M. Hemez, eds. Los Alamos National Laboratory, 2005, pages 27–43 *(see file in the folder)*

2.2 Optional reading

Igos E, Benetto E, Meyer R, Baustert P, Othoniel B (2019). How to treat uncertainties in life cycle assessment studies? Int. J. Life Cycle Assess. 24, 794–807. doi:10.1007/s11367-018-1477-1

Heijungs R (2019). On the number of Monte Carlo runs in comparative probabilistic LCA. Int. J. Life Cycle Assess. doi:10.1007/s11367-019-01698-4

Pizzol M (2019). Deterministic and stochastic carbon footprint of intermodal ferry and truck freight transport across Scandinavian routes. J. Clean. Prod. 224, 626–636. doi:10.1016/j.jclepro.2019.03.270

Groen EA, Bokkers EAM, Heijungs R, de Boer IJM (2017) Methods for global sensitivity analysis in life cycle assessment. Int J Life Cycle Assess 22:1125–1137. doi: 10.1007/s11367-016-1217-3

Pizzol M, Sacchi M, Köhler S, Anderson Erjavec A (2021) Non-linearity in the Life Cycle Assessment of Scalable and Emerging Technologies. Frontiers in Sustainability, 13. https://doi.org/10.3389/frsus.2020.611593

Hertwich et al (2018). Nullius in Verba1: Advancing Data Transparency in Industrial Ecology (https://doi.org/10.1111/jiec.12738), 22 (1), 6-17.

Limpert, E., Stahel, W.A., Abbt, M., 2001. Log-normal Distributions across the Sciences: Keys and Bioscience 51, 341–352.

3 Input-output and hybrid LCA

3.1 Mandatory reading

Merciai S, Schmidt J (2017). Methodology for the construction of global multi-regional hybrid supply and use tables for the EXIOBASE v3 database. Journal of Industrial Ecology, early on-line view 12 December 2017.

Weidema B P, Ekvall T, Heijungs R (2009). Guidelines for applications of deepened and broadened LCA. Deliverable D18 of work package 5 of the CALCAS project. *(read chapter 2)*

3.2 Optional reading

Stadler, K, Wood, R, Bulavskaya, T, Södersten, CJ, Simas, M, Schmidt, S, Usubiaga, A, Acosta-Fernández, J, Kuenen, J, Bruckner, M, Giljum, S, Lutter, S, Merciai, S, Schmidt, J, Theurl, MC; Plutzar, C, Kastner, T, Eisenmenger, N, Erb, KH, de Koning, A, Tukker, A (2018). EXIOBASE 3: Developing a time series of detailed environmentally extended multi-regional input-output tables. Journal of Industrial Ecology, early on-line view January 2018.

Huysman S, Schaubroeck T, Goralczyk M, Schmidt J, Dewulf J (2016). Quantifying the environmental impacts of a European citizen through a macro-economic approach, a focus on climate change and resource consumption. Journal of Cleaner Production 124:217–225.

Schmidt J, Muñoz I (2014). The carbon footprint of Danish production and consumption – Literature review and model calculations. Danish Energy Agency, Copenhagen http://lca-net.com/p/961 *(read chapter 3.5 and 5.4)*

Schmidt J, Merciai S, Delahaye R, Vuik J, Heijungs R, de Koning A, Sahoo A (2012). CREEA report: Recommendation of terminology, classification, framework of waste accounts and MFA, and data collection guideline. Deliverable 4.1 of the EU FP7-project CREEA. http://lca-net.com/p/963 *(read chapter 1-6, chapter 5 should not be read in detail)*