

MGMT 608: Life-Cycle Assessment, Life Cycle Thinking, and Business Strategy
Spring 2019 – CRN: 33522
v5 (final)

Syllabus

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Course Description and Objectives

Thinking in terms of full product and service life cycles is a crucial business skill, especially in an age of resource scarcity, new emerging policy objectives, shifting consumer preferences, broadening stakeholder concerns, and price volatility for energy and materials. This course is tilted specifically toward life-cycle greenhouse gas emissions (hereafter referred to with the shorthand “carbon”), but set in the context of formal life-cycle assessment (LCA) and broader life-cycle thinking involving multiple impact categories.

The course is motivated by a few key challenges, each with an associated learning objective.

Business Challenge	Learning Objective
People in the business world often want to ask questions like “What are the environmental impacts of this product?” or “What does it mean to assess the sustainability of what we do?”	Life-cycle thinking is challenging and often poorly defined in the minds of decision makers and those who serve them. To address that challenge, I aim for the course to give you a range of examples that help you have educated guesses about what is <i>material</i> in a given life cycle, as well as good first questions about what to analyze. LCA is a helpful set of tools with which to do this.
Often, executive-level and other decision makers receive or commission technical analyses addressing key questions like the ones above – and then they must interpret the results.	I find that the best way to be a good <i>consumer</i> of LCA is to have spent a little time as a <i>producer</i> of LCA. To that end, we’ll go through some piece of the work of an LCA and related analytical exercises. Along the way, I’ll hope you gain a general understanding of the approach and method of life-cycle assessment.
Climate impacts and climate strategy aren’t going away.	Grasp basic concepts of carbon accounting and climate policy, with particular reference to their implications for business strategy.
As human beings, we lack consistent intuition outside matters related to our direct experiences. Since the world is hopelessly vast, we must rely on a key examples to guide us in unfamiliar situations.	Build quantitative, detail-rich intuition for life-cycle impacts, especially but not exclusively for life-cycle carbon. Draw on a wide range of examples that, individually and collectively, contain insights that are potentially portable to other settings.

Accordingly, the course has several threads that change in emphasis throughout the ten weeks. We begin with a discussion of LCA, and the first several weeks focus on examples of life-cycle assessment, often with an exclusive or dominant focus on life-cycle carbon (or carbon and energy). Business strategy readings and reinforcing activities start early but become the focus in the middle of the course..

Course Material

We will use Canvas a lot. You're getting this syllabus as a Google Doc, but all of the quizzes and assignment submissions take place on Canvas. The vast majority of readings are available in the public domain. Some are trickier to reach; I will post those to **Canvas**.

Course Policies and Procedures

Communication: I will communicate mainly by e-mail or Canvas, roughly once per week. When you write to me, please put "MGMT 608 - LCA" in the subject heading of your e-mail in order to ensure that I notice it. If you don't put that tag in the subject heading, I am not responsible for that e-mail. Seriously.

Class Preparation and Participation: You are expected to prepare for, attend, and actively participate in classes. This syllabus contains some preparation instructions for each class session. Accordingly, the quality of your learning is directly related to the quality of your preparation.

Tech in the Classroom: I encourage you to bring a laptop to class, but please do not surf the web during class unless your purpose is tied to our discussion. If you bring a phone, please do not text unless absolutely necessary. These practices are disrespectful to your fellow students and to me. In general, it is easy to detect when a student is idly surfing or texting rather than doing so to add to the class or taking notes. So please...don't. Thank you.

Assignments: Other than the final exam, you have three types of assignments: quizzes, in-class activities, and written work. For the first two, *there are no do-overs*. Once a quiz or in-class activity has passed, it cannot be made up if you missed it, nor can it be re-taken. If you consider all students, there are more than 300 individual assignments during the term, so if you miss one or mess one up, so be it.

That said, there are so many of these assignments that missing one or two is unlikely to affect your grade.

For the major written assignment, I will be extremely available to coach and guide your work. Please take advantage of my time early and often.

Citing Sources: For written assignments, you must cite your sources according to the guidelines given by the UO library and using an accepted format. Please see: researchguides.uoregon.edu/citing-plagiarism. For some sources, especially those available only on the internet, citations are sometimes trickier. In those situations, don't waste a lot of time worrying about format; instead, follow the spirit and purpose of citations – clear description of the source, with clear directions to finding it so a reader can retrace the writer's steps.

Absences: Please inform me as soon as possible if you will be absent from class, and we can work out a way to accommodate the absence. In general, missing class means zero credit for graded in-class activities.

Academic Integrity: I will not tolerate plagiarism or cheating. If you are found to be cheating, I will, without exception, pursue punishment to the fullest extent that University and LCB policies allow. Sadly, these issues have become a significant problem on this campus and other campuses; sometimes they occur in gray areas that are not obvious to the student. Please become familiar with the UO policies. The University Student Conduct Code (available at conduct.uoregon.edu) defines academic misconduct.

- **Ethics:** The Lundquist College of Business Code of Conduct must be followed at all times. It can be found at <https://business.uoregon.edu/code-of-conduct>
- **Academic Misconduct at the University of Oregon (including plagiarism):** <https://dos.uoregon.edu/academic-misconduct>.

Course Requirements

Grades will be based on the following individual assignments. You will receive a more detailed explanation of each written assignment in class.

Deliverable	Due Date	Percent
Contributions to class discussion, including in-class activities	Ongoing	15%
Quizzes on Canvas (~10 of them)	Ongoing	15%
Problem sets (4)	Weeks 3, 4, 5, and 7	20%
LCA group project (with openLCA)	Saturday, June 8, 2019	25%
Take-home final exam	TBD, sometime in exam week	25%

Contributions to class discussion, including in-class activities (15%)

There will be 12-15 in-class small-group assignments throughout the quarter, nearly one per class session. Recent research on the science of teaching and learning suggests that such activities that provide practice using concepts can be a valuable tool. They will be submitted and graded on Canvas.

Quizzes (15%)

There will be 1-2 quizzes per week beginning in week 2 (the first week of class). They will be on Canvas, so set your notifications so you are reminded about these! I might also have a few in-class pop quizzes.

Problem sets (20%)

You will have four (4) assignments involving calculations and various aspects of LCA, each worth 5% of your grade:

1. Household carbon footprint
2. Recycled vs. virgin paper
3. EIOLCA side-by-side analysis
4. openLCA mechanics – packaging analysis

See the detailed descriptions on Canvas, and the short description after the week-by-week summary below.

LCA group project (25%)

In this analysis and short report, you will assemble a simple LCA using openLCA (www.openlca.org), with one or two alternative pathways that show greater or lesser life-cycle impact than your baseline. We will discuss this assignment throughout the quarter, and you'll get a lot of guidance on the tool and the write-up. See Canvas for the Google Doc with the project descriptions.

Format: You will do this work in teams (of 2-3), and I will facilitate your grouping in the first couple of weeks. In general, the entire short report should be no more than 3,000 words and no more than ten (10) pages, including tables and graphs. You must describe clearly what you have done, but the focus is on interpretation so I know you've understood the results.

Final exam (25%)

The final will be a one- or two-day open-book open-note take-home exam with a few essay questions requiring around 2,500 words. It won't have to be polished, but I will expect the essays to be clearly written and well organized. In general, my final exams are entertaining learning experiences, but they demand that you keep pace with the material throughout the quarter. If you do that, you'll be fine.

Learning openLCA and conducting your own LCA

Few if any of you will go on to do LCA for a living. Perhaps ten thousand people globally do this sort of analysis as their primary job function, so it isn't a big market. But the best way to become a savvy *consumer* of LCA is to build some empathy for the *producer* of LCA, and the software tool for this work is especially well-suited to building an awareness of the complete technical process.

Furthermore, learning new software is a critical skill, and one that improves with practice. For this course, you will achieve basic mastery of openLCA, an open-source platform professional-grade functionality. I'll give some overview in lecture so we can understand how openLCA fits into a broader ecosystem of technical tools for this kind of analysis.

Although LCA is complex and openLCA has wide-ranging functionality, the web provides a ton of openLCA tutorials and other LCA-related materials that will ramp you up from zero.

DO NOT WAIT to start using openLCA. You should watch at least the first two tutorials in week 2.

Here's the list we will draw upon.

- This is the place to start to get a quick sense of the mechanics of openLCA after you've installed it: "How to import a database and impact methods to openLCA," youtu.be/FqVMbwhAEW4
- We're using openLCA instead of GaBi (another LCA tool), but this introduction to GaBi is a good intro to LCA generally: "Part 1: What is LCA, and how do you carry out an LCA with GaBi?," <http://www.gabi-software.com/support/gabi-learning-center/gabi-learning-center/part-1-lca-and-introduction-to-gabi/>. The following chapters are essential (and relevant beyond GaBi). Note that they are short, but you'll likely have to stop them to take notes and/or watch them several times:
 - 02) ISO 14044, Goal, scope and functional units (03:32)
 - 03) System boundaries, allocation and data collection (04:13)
 - 04) LCI, LCIA, classification and characterization (04:48)
- This is the "How to create flows, processes, product systems and projects in openLCA," <https://youtu.be/kEosW6PceVg>

Other resources:

- openLCA has collected a few videos here: www.openlca.org/learning/
- This doc will guide you through installation and set-up: www.openlca.org/wp-content/uploads/2017/04/1.6-Getting-started.pdf
- thinkstep has put all of the GaBi videos here: www.gabi-software.com/international/support/gabi-learning-center/gabi-learning-center/

Weekly Topics and Readings

Week 1 – no class – people are traveling

Week 2 (April 8 and 10) – LCA, the big picture, and music

This opening week is a bit heavy, but I promise that, if you can hold these pieces with you as the quarter progresses, they will provide glue and context for the many building blocks we will consider.

We'll open up this week with overview material at a high level: the entire U.S. economy. This is an important level at which to have some intuition, and with some different angles into aggregate emissions.

- *Life Cycle Assessment: Principles and Practice*, SAIC (2006). p. v-vi and 1-18.
www.cs.ucsb.edu/~chong/290N-W10/EPAonLCA2006.pdf
- U.S. EPA Office of Solid Waste and Emergency Response. (2009). *Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices*. p. 1-12, A-1 through A-3. www.epa.gov/oswer/docs/ghg_land_and_materials_management.pdf.
- EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks* (www.epa.gov/sites/production/files/2019-02/documents/us-ghg-inventory-2019-main-text.pdf) is long and detailed. I merely want you to think about the following items from the executive summary: Table ES-1, Figure ES-1, Figure ES-4, Figure ES-6, Figure ES-7, Table ES-3. Each will have a fairly short punchline, and in aggregate they will provide some additional insights.

We will complement the big picture with our first LCA, a quick glance at carbon accounting, and a carbon footprinting tool aimed at the individual or household.

- World Resources Institute and World Business Council for Sustainable Development. *Value Chain (Scope 3) Accounting and Reporting Standard*. Watch [the short video](#), read section 1, look closely at [the diagram](#). www.ghgprotocol.org/standards/scope-3-standard.
- Weber, C., Koomey, J., and Matthews, H. (2009). *The Energy and Climate Change Impacts of Different Music Delivery Methods*. Read p. 1-18 and browse the calculations section: onlinelibrary.wiley.com/doi/10.1111/j.1530-9290.2010.00269.x/full.
- The Berkeley Institute of the Environment. (n.d.). *CoolClimate Carbon Footprint Calculator*. Link: coolclimate.berkeley.edu/carboncalculator.

You have no required reading for this item, but I'll discuss it briefly in class. Here's the source:

- Greenpeace (2017). *Clicking Clean: Who is Winning the Race to Build a Green Internet?* (download at <http://www.clickclean.org/usa/>). Read through p. 19.

Quiz #1 will be open on Friday.

You should start messing around in openLCA soon (or now!), but at the very least this week, watch the GaBi-related videos mentioned above as they provide essential background on LCA.

Week 3 (April 15 and 17) – food and water

We will have many examples this quarter involving food and agriculture. As you'll see, food and food-related life cycles are an excellent place to build intuition of broader relevance. As you read these items, really pay attention to boundaries and to the potential areas for sensitivity analysis.

- Weber, C. and Matthews, H. (2008). Food-Miles and the Relative Climate Impacts of Food Choices in the United States. *Environmental Science & Technology*. p. 1-6 (all). Available at psufoodscience.typepad.com/psu_food_science/files/es702969f.pdf.
- Environmental Working Group (2011). *Meat Eater's Guide to Climate Change and Health – Lifecycle Assessments: Methodology and Results*. Read to p. 20, Figure 1 (p. 23), skim results. static.ewg.org/reports/2011/meateaters/pdf/methodology_ewg_meat_eaters_guide_to_health_and_climate_2011.pdf.
- Oregon DEQ. (2009). *Life Cycle Assessment of Drinking Water Systems: Bottle Water, Tap Water, and Home/Office Delivery Water*. ES-1 through ES-9, 4-1 through 4-19. Available at <https://www.oregon.gov/deq/FilterDocs/wprLCycleAssessDW.pdf>.

This is the week you should start really paying attention to the definitions of different impact categories. Read p. 16-21 here and come with questions:

- “Impact assessment methods in Life Cycle Assessment and their impact categories,” www.openlca.org/wp-content/uploads/2015/11/openLCA_LCIA_METHODS-v.1.5.6.pdf

We will look at the punchlines for many of DEQ's food LCAs and supporting documents. No assigned reading yet, but I'll start referring to these in lecture:

- “Environmental Footprints of Foods,” Oregon Department of Environmental Quality www.oregon.gov/deq/mm/food/Pages/Product-Category-Level-Footprints.aspx

Start messing around in openLCA this week if you haven't already. Follow the guidance in lecture slides.

Due Friday – Problem set #1: household carbon footprint

Quiz #2 and Quiz #3 will happen this week.

If it's relevant to your project, you should learn to use the public-domain Food Carbon Emissions Calculator, and be able to put the results in context of other readings:

www.foodemissions.com/foodemissions/Calculator.aspx

Week 4 (April 22 and 24) – shelter and paper

This reading – “the house LCA” as I will call it – is the most substantial and multifaceted multiple-impact-category LCA that we'll read. Please work hard to find a handful of distinct take-aways. Note that some of this analysis is tilted toward life-cycle GHGs, but it's also a full LCA with multiple impact categories.

- Oregon DEQ (2010). *A Life Cycle Approach to Prioritizing Methods of Preventing Waste from the Residential Construction Sector in the State of Oregon*. Final Report (Phase 2). Available at www.oregon.gov/deq/FilterDocs/ADU-ResBldgLCA-Report.pdf, through Executive Summary, then also p. 1-23; figures on page 31, 51, 55, 57 (Fig. 10, Table 8, Fig. 16, Fig. 19); p. 76-78.

Read these for Wednesday:

- Gemechu et al (2013). “A comparison of the GHG emissions caused by manufacturing tissue paper from virgin pulp or recycled waste paper,” International Journal of Life Cycle Assessment. link.springer.com/article/10.1007%2Fs11367-013-0597-x.
- EnvironmentalPaper.org’s Paper Calculator - <https://calculator.environmentalpaper.org/home>. Do 2-3 queries with the calculator, including at least one involving both recycled and virgin paper, and note (a) the life-cycle impact categories generally and (b) the life-cycle GHG differences in particular.

Due Friday – Problem set #2: recycled vs. virgin paper, with some twists. Parameters for this assignment:

- Submit a one-page PDF on Canvas.
- Be clear upfront about your major conclusions.
- Focus on GHG impacts, but comment on either clear trends or mixed results with other impact categories. Briefly specify those impact categories you use, as well as the ones you exclude from your discussion and analysis.
- You may paste graphics, but make sure you explain anything that needs explanation.

Quiz #4 and Quiz #5 will happen this week.

Week 5 (April 29 and May 1) – carbon! (accounting, risk and opportunity, pricing)

With some LCA under our belts, it’s time to look closely at carbon pricing and consider sector-specific and economy-wide implications of it.

- Carbon Disclosure Project, *Carbon Pricing Pathways - Executive Summary* (all – it’s short), download at [this link](#).
- McKinsey & Company (2009). *Pathways to a Low-Carbon Economy*. p. 5-29, https://www.mckinsey.com/~media/mckinsey/dotcom/client_service/sustainability/cost%20curve%20pdfs/pathways_lowcarbon_economy_version2.ashx.
- “CDP data reveals shortfall in carbon disclosure by North American companies,” www.greenbiz.com/article/cdp-data-reveals-shortfall-carbon-disclosure-north-american-companies

I will introduce EIOLCA on Monday, but please read about it in advance, and be ready to get good at it between Monday and Wednesday. Also, you will be required to use it for a problem set:

- EIOLCA
 - Get a one-page overview of the tool here: <http://www.eiolca.net/Method/index.html>
 - Select “Follow the written tutorial” here: <http://www.eiolca.net/tutorial/index.html>
 - Then make sure you arrive in class having experimented with 8-10 sectors: <http://www.eiolca.net/cgi-bin/dft/use.pl>
- WRI and WBCSD. *Value Chain (Scope 3) Accounting and Reporting Standard*. Review the video and diagram from week 2.

Quiz #6 and Quiz #7 will happen this week.

Week 6 (May 6 and 8) – car and fuel

The main content this week describes the life cycle of EVs and compares it to ICE vehicles. We’ll start with full-blown LCAs and then look at some information created for policy advocacy. Note that these two LCAs give highly qualified punchlines, so as you read, focus on the important variables in the sensitivity analysis.

- Hawkins et al. (2012) “Comparative Environmental Life Cycle Assessment of Conventional and Electric Vehicles,” onlinelibrary.wiley.com/doi/10.1111/j.1530-9290.2012.00532.x/full (read all)
- “Life cycle assessment of future electric and hybrid vehicles: A cradle-to-grave systems engineering approach,” (2016), www.sciencedirect.com/science/article/pii/S0263876216301824
- Tesla, *2018 Impact Report* (2019). Read p. 1-9, 15-23, and 32-34. As you read, consider how the impacts Tesla describes (a) might show up in an LCA and (b) whether and where Tesla is taking credit for the (positive) impacts of others. www.tesla.com/ns_videos/tesla-impact-report-2019.pdf
- The Union of Concerned Scientists has a clear advocacy position for which is draws on LCA:
 - Watch the two-minute video and read the three-page executive summary here, especially noting the regional variation: www.ucsusa.org/clean-vehicles/electric-vehicles/life-cycle-ev-emissions
 - Read this page and tinker with the tool, using at least two cars in two locations: www.ucsusa.org/clean-vehicles/electric-vehicles/ev-emissions-tool

We will consider biofuels explicitly in class, but we’ll also take a particular view of energy that will inform our understanding of energy with a unique unit of impact (look closely for that unit and come up with a name for the “impact category” – other than *energy sprawl*):

- McDonald, R., Fargione, J., et al. (2009). “Energy Sprawl or Energy Efficiency: Climate Policy Impacts on Natural Habitat for the United States of America.” p. 1-9 (all). www.plosone.org/article/info:doi/10.1371/journal.pone.0006802.

We will dabble in materials choices in an automotive setting with a look at work from a major steel producer and an auto OEM. Compare the conclusions.

- ArcelorMittal, “Lightening the footprint of commercial vehicles” and “Introduction” (current web content). Read these two pages on the steel company’s automotive work: automotive.arcelormittal.com/Related_stories/Lightening_footprint_commercial_vehicles, automotive.arcelormittal.com/Sustainability/LCA/Introduction
- *Audi. Life Cycle Assessment – Audi looks one step ahead*, (2017). Read p. 12-23 (mostly pictures and negative space!) and focus on materials selection issues and implications.

Quiz #8 and Quiz #9 will happen this week.

Week 7 (May 13 and 15) – apparel

Apparel life cycles are surprisingly complicated. As we’ll discuss in class, they might be *more* complicated than the life cycles of buildings, at least in particular ways. Be on the look-out for how life-cycle greenhouse gas emissions might not provide a good summary or snapshot of the overall impact (and we’ll consider that point further in week 8):

- The Life Cycle of a Jean: Understanding the environmental impact of a pair of Levi’s 501 Jeans, levistrauss.com/wp-content/uploads/2015/03/Full-LCA-Results-Deck-FINAL.pdf.
- *Valuing Our Clothes*, WRAP UK, www.wrap.org.uk/sustainable-textiles/valuing-our-clothes%20
 - Read through p. 7, the claim at the bottom of p. 8, p. 11, and the diagram on p. 13, all from the 2015 report here: www.wrap.org.uk/sites/files/wrap/VoC%20FINAL%20online%202012%2007%2011.pdf
- Greenpeace. Read the About page for the Detox campaign (www.greenpeace.org/international/en/campaigns/detox/fashion/about/) and skim the report *Toxic Threads: The Big Fashion Stitch-Up* for vibe and major messages

(www.greenpeace.org/international/Global/international/publications/toxics/Water%202012/ToxicThreads01.pdf) and the report *Leaving Traces*,

- [www.greenpeace.org/international/en/publications/Campaign-reports/Toxics-reports/Leaving-Traces/Life Cycle Assessment of Cotton Cultivation Systems Better Cotton, Conventional Cotton and Organic Cotton](http://www.greenpeace.org/international/en/publications/Campaign-reports/Toxics-reports/Leaving-Traces/Life-Cycle-Assessment-of-Cotton-Cultivation-Systems-Better-Cotton-Conventional-Cotton-and-Organic-Cotton), thinkstep (2018). Read the executive summary and focus on the comparisons among production systems.
- Read this web page and consider the statements and numbers provided on pesticide use for conventional cotton: <https://cottontoday.cottoninc.com/agriculture-4/pesticides/>

Quiz #10 will happen this week.

Week 8 (May 20 and 22) – life-cycle thinking in corporate frameworks and social impacts

This week we will look at social impacts and how they appear in LCA, as well as in emerging efforts to address two large industries with environmental and social challenges, cotton and sugar.

Consider these four items together. The first item is an LCA presented quickly and succinctly; try not to get distracted by unfamiliar impact categories, but instead seek to understand the basic points. The two other short pieces force us to consider to what extent LCA formally can be connected to life-cycle thinking more broadly. Finally, we'll try to put Greenpeace's hard-hitting *Detox* effort (from last week) in fuller context with these other materials.

- Franziska Eisfeldt and Franziska Möller (2015), "Social and environmental impacts of a T-shirt: A life cycle approach," www.openlca.org/wp-content/uploads/2015/11/Presentation_S-LCA_E-LCA_T-shirt.pdf

Of course, apparel isn't the only place where "social LCA" would be relevant. A snippet to consider:

- "The logo that shows if your Easter eggs were made by child labour," *The Guardian*, March 2018 www.theguardian.com/lifeandstyle/2018/apr/01/the-logo-that-shows-if-your-easter-eggs-were-made-by-child-labour

Browse these two efforts and try to read between the lines – why cotton and sugar? These two global commodities have some astonishing overlap in both their respective colonial histories and the persistence of those histories into present-day issues with labor practices and supply chains. Furthermore, as a result of these issues and the sheer scale, each of the commodities has spawned its own global voluntary corporate collaboration. Why do such efforts exist for these two commodities? What life-cycle impacts must exist in order to lead to these efforts?

- Better Cotton Initiative (BCI), bettercotton.org. Read all of *About BCI*, and skim "Production Principles and Criteria" (bettercotton.org/wp-content/uploads/2014/10/production-principles-and-criteria.pdf)
 - Also read this commentary on BCI: [Skov and Guillory \(2019\), "Is Better Cotton really better?" \(TBD\)](#)
- Bonsucro, www.bonsucro.com/what-is-bonsucro/, en.wikipedia.org/wiki/Bonsucro

Quiz #11 will happen this week.

Due Friday – Problem set #3: packaging comparison in openLCA.

Week 9 (May 27 and 29) – frameworks for buying things

Note: Memorial Day is May 27, so we have only one class meeting this week.

The focus this week should be on your projects, but you have a few discrete questions to answer based on a handful of readings.

Oregon DEQ has fostered some excellent work on cement and concrete, an area of immense impact and opportunity.

- Which concrete should I buy?
 - You'll have to understand Environmental Product Declarations (EPDs) for concrete by looking at Oregon Concrete and Aggregate Producers Association web site: ocapa.net/oregon-concrete-epds - includes "What is an EPD?"
 - Unless you already know about compressive strength, you'll want to read the short first item ("1. Learn about the basic design mixes used in concrete production") at [this page](#).
 - Then read p. 3, table 1, and the tables in p. 18-24 of this document : nrmca.org/sustainability/EPDProgram/Downloads/NRMCA%20EPD%2012.07.2014.pdf
 - As you consider how to judge, consider only three impact categories: GWP, eutrophication, and air pollution (POCP). You should be able to describe what you see with and without carbon goggles.
- For broader context on EPDs: "Maturing the market one EPD at a time," Buffaloe, Sarah (2014). www.usgbc.org/articles/maturing-market-one-epd-time.

We will look at one certification framework and one firm as we consider frameworks for buying things in the realm of IT.

- Which computer should you buy? To answer, use EPEAT!
 - Electronic Product Environmental Assessment Tool (EPEAT – www.epeat.net). Select one product and use its score to see the entire EPEAT framework (i.e., how one meets minimum requirements and scores points toward gold, silver, or bronze). How is this framework similar to or different from LCA?
- Apple
 - In Apple's 2018 report, see the p. 6 summary of its carbon footprint: www.apple.com/environment/pdf/Apple_Environmental_Responsibility_Report_2018.pdf
 - Read all of the Environment page (www.apple.com/environment/) and the Finite Resources topic page(www.apple.com/environment/finite-resources).
 - At the Reports page (www.apple.com/environment/reports/), read the short reports for the iPhone 6S, and compare the [27" iMac from 2012](#), and [27" iMac from 2010](#).
 - Look at Apple's recycling robot and try to put it in context of the firm's overall impacts: "Apple Debuts New iPhone Recycling Robot Daisy and GiveBack Trade-In Program," MacRumors, www.macrumors.com/2018/04/19/apple-new-daisy-robot/

Week 10 (June 3 and 5) – corporate life-cycle communication, brand-specific frameworks for performance and claims, and some closing synthesis

Hot on the heels of Apple, we will look at two sets of corporate examples and assess their grounding (or lack thereof) in life-cycle thinking and analysis. Consider the extent to which they offer good thinking and clear messages.

- Patagonia
 - Browse Materials & Technology(www.patagonia.com/us/patagonia.go?assetid=2076), and for 3-4 materials and one technology, describe the impact categories in which a given material or technology would demonstrate improved performance.
 - Under *Shop*, find two products that you would use, and read the product-specific content on environmental and social issues, including the associated Footprint Chronicles links. Qualitatively assess how an LCA of those products could reveal better performance.
- Nike
 - In Nike’s [FY16/17 Sustainable Business Report](#), read p. 6-7 and 10-14 (sbi-prd-s3-media-bucket.s3.amazonaws.com/wp-content/uploads/2018/05/18175102/NIKE-FY1617-Sustainable-Business-Report_FINAL.pdf).
 - Browse the company’s central sustainability page (purpose.nike.com) to see how the firm selects themes and crafts major messages. Does this feel like LCA?
 - Skov, “Making Progress? The questions we should be asking about corporate sustainability,” joshuaskov.info/2018/09/18/making-progress-the-questions-we-should-be-asking-about-corporate-sustainability/

Final project due at noon on Saturday, June 8, 2019.