Engineering Tripos Part IIA, 3E11: Environmental Sustainability & Business, 2019-20

Module Leader

Prof J A Howard-Grenville [1]

Leader

Prof J A Howard-Grenville

Lab Leader

Prof J A Howard-Grenville [1]

Timing and Structure

Michaelmas term

Aims

The aims of the course are to:

- Identify the practical challenges and opportunities facing businesses in terms of integrating sustainability into their operations and value chains.
- Critically examine the conceptual tools and best practices used to prioritize and deliver on improved environmental sustainability outcomes.

Objectives

As specific objectives, by the end of the course students should be able to:

- Apply systems thinking, lifecycle assessment, and other frameworks to business sustainability problems.
- Be able to be critical consumers of sustainability metrics, reporting and information in their business and personal lives.

Content

In this course, we will explore the challenges and opportunities presented for businesses attempting to integrate more environmentally sustainable practices. Much of the work done today in service of sustainability simply (though admirably) amounts to doing “less bad,” by, for example, reducing employee commuting, minimizing waste, or curbing carbon emissions. But sustainability demands fundamental realignment of business practices and system-wide innovation to radically reduce the ecological footprint of business to within planetary boundaries. Approaches and tools for managing environmental sustainability include those that help us think systematically about impacts, draw meaningful comparisons, and assess opportunities for change within a business’ own operations, its supply chain, and with partners. After taking this course, you will be able to help organizations integrate environmental sustainability into their operations and help them develop the more sustainable business processes and services of the future.

Overview of Course Sessions

Grasping the Extent and Nature of the Problem... and Why it's a Business Issue

Sustainability as a System Condition

Shifting Pressures and Responses: Towards Strategic Business Sustainability

Changing Business Models: Circular Economy and Industrial Symbiosis

Working Across the Value Chain: Life Cycle Assessment

Consumer and Market Considerations

Risk, Compliance, and Capital

Changing Organisations and Systems

3E11: ENVIRONMENTAL SUSTAINABILITY and BUSINESS

Professor Jennifer Howard-Grenville

Judge Business School

University of Cambridge

Office Judge Business School SS4.15

E-Mail: j.howard-grenville@jbs.cam.ac.uk [2]

Course Content

In this course, we will explore the challenges and opportunities presented for businesses attempting to integrate more environmentally sustainable practices. Much of the work done today in service of sustainability simply (though admirably) amounts to doing "less bad," by, for example, reducing employee commuting, minimizing waste, or curbing carbon emissions. But sustainability demands fundamental realignment of business practices and system-wide innovation to radically reduce the ecological footprint of business to within planetary boundaries. Approaches and tools for managing environmental sustainability include those that help us think systematically about impacts, draw meaningful comparisons, and assess opportunities for change within a business' own operations, its supply chain, and with partners. After taking this course, you will be able to help organizations integrate environmental sustainability into their operations and help them develop the more sustainable business processes and services of the future.

Course Aims

Students will gain an understanding of the following key areas:

- Identify the practical challenges and opportunities facing businesses in terms of integrating sustainability into their operations and value chains.
- Critically examine the conceptual tools and best practices used to prioritize and deliver on improved environmental sustainability outcomes.

The skills gained in this course include fostering the ability to:

- Apply lifecycle assessment and systems thinking to business sustainability problems.
- Become critical consumers of sustainability metrics, reporting and information in their business and personal lives.

Requirements

In order to maximally benefit from this course it is imperative that you come prepared for each lecture *by preparing the relevant readings and case studies as indicated in this document*. You will be expected to not only attend all lectures, but also actively participate in class discussions. When you actively participate, everyone benefits from a more positive learning environment and the class becomes more interesting and fun. You should also attend and prepare for supervisions. Each supervision is an essential element of the course.

Assessment

Your grade will be determined by exam only. The exam will last for 1 ½ hours. There will be 3 questions of which 2 must be answered. In addition, you may choose to submit one piece of coursework. The coursework consists of an essay of no more than 2,000 words. The specifc topic for the essay is on Moodle and further detail will be announced in class.

Supervisions

You will have 3 supervisions as part of this course. You will be asked to prepare an essay or written exercise for each supervision and be ready to discuss it with your supervisor and other students. Please refer to the end of this document for further details on the supervision sessions.

Overview of Course Sessions:

Session 1: Grasping the Extent and Nature of the Problem... and Why it’s a Business Issue

Session 2: Sustainability as a System Condition

Session 3: Shifting Pressures and Responses: Towards Strategic Business Sustainability

Session 4: Changing Business Models: Circular Economy and Industrial Symbiosis

Session 5: Working Across the Value Chain: Life Cycle Assessment

Session 6: Consumer and Market Considerations

Session 7: Risk, Compliance, and Capital

Session 8: Changing Organisations and Systems

Handouts

In order to protect the environment, lecturers are encouraged not to disseminate hardcopies of the lecture slides, but rather to upload the slides in advance of each session. We hope that this arrangement will work well for you.

Reading List

General Reading

Each of these books offers valuable perspectives on business and (and/or) environmental sustainability. Some of them cover a wide range of industries and/or materials, and should be treated as general references for those wishing to go deeper into a particular issue, for example for a supervision or coursework paper. Others are valuable primers about the issues at hand.

Senge, P. et al. (2010)	*The Necessary Revolution: How Individuals and Organizations are Working Together to Create a Sustainable World.* Crown Publishing	**Library lin**
Ehrenfeld, J. (2009)	*Sustainability by Design: A Subversive Strategy for Transforming Our Consumer Culture.* New Haven, CT: Yale University Press	**Library lin**
Graedel, T. & Howard-Grenville, J. (2005)	*Greening the Industrial Facility: Perspectives, Approaches, and Tools.* New York, NY: Springer	**Library lin**
Allwood, J. M. & Cullen, J. M. (2015)	***Sustainable Materials - Without the Hot Air: Making Buildings, Vehicles and Products Efficiently and with Less New Material*. Cambridge, UIT Press.**	All chapters at: http://www.hp [3]
Wadhams, P. (2017)	*A farewell to ice: A report from the Arctic*. Oxford University Press.	**Library lin**
Helm, D. (2015)	*Natural capital: valuing the planet*. Yale University Press.	**Library lin**

Detailed Reading

While readings under “required preparation” represent essential preparatory work prior to each class, there is no expectation that you will read literature marked as optional reading. The intention is to give you the option of reading more deeply on topics that interest you, and to provide a taste of the academic literature that has pushed the field of business and sustainability research forward. If you wish to read further on any topic, please ask me as there are a number of other valuable resources that I can point you toward.

Session 1: Grasping the Extent and Nature of the Problem... and Why it’s a Business Issue

During the first session, we will explore the state of the problem of environmental sustainability and business. We consider how business organizations both contribute to the current state of planetary health, and, importantly, must act within its constraints. We will look at recent trends and their implications for business through the various lenses of how business organizations experience sustainability pressures and opportunities.

Required Reading

Howard-Grenville, J., & Hoffman, A. J. 2003. The importance of cultural framing to the success of social initiatives in business. *Academy of Management Executive,* 17(2): 70-84.

Optional Reading

Hoffman, A. J. 2018. The next phase of business sustainability. *Stanford Social Innovation Review*. Spring 2018, 35-39.

Figueres, C., Schellnhuber, H. J., Whiteman, G., Hobley, A., & Rahmstorf, S. (2017). Three years to safeguard our climate. *Nature*, *546*(7660), 593-595.

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., ... & Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, *347*(6223), 1259855.

Session 2: Sustainability as a System Condition

In this session, students will form teams to play a simulation game that introduces ideas of systems dynamics and the 'tragedy of the commons,' two ideas that underpin the complexity of environmental sustainability issues and illuminate the inherent challenges to their resolution by business organizations.

Required Reading

Fishbanks Introduction (2 pages); posted prior to simulation.

Optional reading:

Hardin, G. (1968). The tragedy of the commons. *Science*, 162(3859), 1243-1248

Dietz, T., Ostrom, E., & Stern, P. C. (2003). The struggle to govern the commons. *science*, *302*(5652), 1907-1912.

Ehrenfeld, J. (2008). Sustainability by design. *A subversive strategy for transforming our consumer culture*. New Haven: Yale University. Chapter 2. pp. 11-21.

Sterman, J.D. 2012. Sustaining sustainability: creating a systems science in a fragmented academy and polarized world. In *Sustainability Science* (pp. 21-58). Springer New York.

Session 3: Shifting Pressures and Responses: Towards Strategic Business Sustainability

How are current pressures shaping the state of conversation and action on business sustainability? Do frameworks like the UN Sustainable Development Goals (SDGs) fundamentally alter how businesses engage with the issues, or are they mostly a new way of talking about these issues? What roles do the investment community, activists, and consumers play? And, in what new ways are businesses responding? We will focus on these questions as we explore ways in which sustainability can be addressed strategically by businesses.

Required Reading

Eccles, R. G., & Serafeim, G. (2013). The performance frontier. *Harvard Business Review*, *91*(5), 50-60.

Optional Reading

Aldy, J.E. & Gianfranco, G. (2019). Future-proof your climate strategy: Smart companies are putting their own price on carbon. Harvard Business Review.

SDG Compass Guide. Available for download at: https://sdgcompass.org/ [4]

SustainAbility (2014) See change: How transparency drives performance. (recommended are the: Executive Summary, the section on Materiality, and the section on Integration. About 16 pages.)

Session 4: Changing Business Models: Circular Economy and Industrial Symbiosis

Some companies are considering shifts in their business models to move towards a more circular economy, premised on the idea that industrial and commercial systems could mimic nature, where material resources are infinitely recycled and there is no such thing as accumulation of 'waste.' What opportunities arise when managers start thinking differently about resources? What are the challenges to putting these types of arrangements in place? We will discuss these questions through analyzing the Cook Composites & Polymers (CCP) case.

*Required Reading – **Case***

Please fully and carefully read the case prior to class and think about your position on the options posed. You will be expected to be ready to share your ideas about the case itself, and the questions it raises, in class.

As you read, think about the environmental and economic benefits of the various options open to Cook Composites & Polymers (CCP), and whether these outweigh the risks? What recommendations do you have for managers at CCP?

Lee, D. Toffel, M. & Gordon, R. Cook Composites & Polymers, Co. Harvard Business School Publishing. Case # 9-608-055. Revised May 21, 2017.

Optional Reading

Frosch & Gallopoulos, 1989. Strategies for Manufacturing. *Scientific American*. 7 pages.

Boons, F., Chertow, M., Park, J., Spekkink, W., & Shi, H. (2016). Industrial symbiosis dynamics and the problem of equivalence: Proposal for a comparative framework. *Journal of Industrial Ecology*.

Chertow, M., & Ehrenfeld, J. (2012). Organizing Self?Organizing Systems. *Journal of Industrial Ecology*, *16*(1), 13-27.

Paquin & Howard-Grenville 2009. Facilitating regional industrial symbiosis: Network growth in the UK's National Industrial Symbiosis Programme. In Boons & Howard-Grenville (Eds.). *The Social Embeddedness of Industrial Ecology*.

Session 5: Working Across the Value Chain: Life Cycle Assessment

Business sustainability demands that companies look well beyond their own operations to examine the footprint of their products, processes, and services more broadly. How do companies do this effectively and what tools can help them think strategically about where and how to optimize across the value chain? We will learn about managerial application of life cycle assessment (LCA), exploring how sustainability impacts can be quantified and compared, and the assumptions and trade-offs that are inherent in such quantification and comparison.

Required Reading

Hellweg, S., & Canals, L. M. 2014. Emerging approaches, challenges, and opportunities in lifecycle assessment. *Science*. 344 (6188): 1109-1113.

Optional Reading

Graedel & Allenby. 2009. Chapter 12: An Introduction to Life Cycle Assessment. In *Industrial Ecology and Sustainable Engineering.* Prentice Hall. pp. 161-173.

Graedel & Allenby. 2009. Chapter 13: The LCA Impact and Interpretation Stages. In *Industrial Ecology and Sustainable Engineering.* Prentice Hall. pp. 175-189.

Toffel, M. & Sice, S. 2011. Carbon Footprints: Methods and Calculations. Harvard Business School Publishing. # 611075. Revision date Dec 19, 2013. 15 pages.

Session 6: Consumer and Market Considerations

Managers have to balance efforts to meet sustainability targets while meeting consumer needs and ideally adding value for consumers or clients. We will explore the tradeoffs around such decision making, and how these reflect or challenge a company's core strategy and capabilities, through a case on M&S.

*Required Reading – **Case***

Please fully and carefully read the case prior to class and think about your position on the options posed. You will be expected to be ready to your ideas about the case itself, and the questions it raises, in class.

Eccles, R., Serafeim, G., and Armbrester, K. Tough Decisions at Marks and Spencer. Harvard Business School Publishing. Case # 9-112-062. Revised September 30, 2015.

Session 7: Risk, Compliance and Capital

Many companies, especially those in certain sectors with high environmental footprints inherent to their products or processes, approach sustainability through the lens of business risk. Increasingly, the investment community is factoring in sustainability risks in their decision-making. How do companies understand and effectively respond to the risks they face associated with sustainability issues? We will explore these questions through case discussion based on Suncor Energy, one of the companies working in Canada's oil sands.

*Required Reading – **Case***

Please fully and carefully read the case prior to class and think about your position on the options posed. You will be expected to be ready to share your ideas about the case itself, and the questions it raises, in class.

Bertels, S., van der Bly, & Bowen, F. 2013. Environmental Compliance at Suncor Energy's Firebag Facility.

Session 8: Changing Organisations and Systems

Making progress on business sustainability requires transformational change, in our financial systems, company practices, and consumption habits. The challenges seem enormous. But they will only happen through people thinking and doing things differently. In this final session, we explore the pathways to transforming organisations and finding leverage within the systems in which they – and we – operate. You will have an opportunity to reflect on your own ability to generate and influence change.

Required Reading

Bhattacharya, C. B., & Polman, P. (2017). Sustainability lessons from the front lines. *MIT Sloan Management Review*, *58*(2), 71.

Optional Reading

Ashford, S. J., & Detert, J. (2015). Getting the Boss to Buy In. *Harvard Business Review*, *93*(1-2), 72-79.

Meadows, D. Leverage points: Places to intervene in a system. http://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/ [5]

Supervisions

To be announced

Biographical information:

Professor Jennifer Howard-Grenville is the Diageo Professor in Organisation Studies at the Cambridge Judge Business School. Her research is focused on how organizations manage change, particularly around environmental and social issues. Jennifer received her PhD at MIT, her MA at Oxford, and her BSc (Eng.) at Queen's University, Canada. She has taught extensively on management and business sustainability to MBAs, Executive MBAs, doctoral students and undergraduates.

Further notes

Teaching Methods:

- Interactive lecture sessions
- In-class simulations and case discussions
- In-class exercises

Coursework

Coursework Title: Business Sustainability Analysis

For this coursework, you are required to write an essay (no more than four pages single spaced; aim for roughly 1,500-2,000 words). Your paper is to be electronically submitted to Moodle at a date to be announced.

In the essay, you will i) summarize the sustainability strategy/actions taken by a company of your choice, ii) analyse these actions, and iii) suggest one or two alternatives that would enhance the company's approach to sustainability. [Please feel free to speak with the Professor about an appropriate company to choose, if you would like some advice.]

The goal is that you explore a company or industry that you are interested in, and have an opportunity to research their sustainability actions through publicly available information.

More guidance will be given on specific questions and course frameworks or theories you might want to explore in your essay.

Learning objectives:

- Apply concepts and frameworks introduced in the lectures to a specific business opportunity/problem.
- Critically examine and discuss tradeoffs that arise in the solutions/proposal.

Practical information:

- The coursework will be an (optional) essay that will help students prepare for the final paper, as the question set will be similar to those encountered on the exam.
- Your essays will be marked according to these criteria:

  Thoroughness of analysis:

  - Thorough treatment of the salient issues for the company selected

  Correct application of frameworks, concepts, theories:

  - Use of theory and frameworks to advance clear and logical analysis
  - Support of answers by appropriate use of evidence and examples
  - Incorporation of relevant lecture material and related literature

Full Technical Report:

Students won't have the option to submit a Full Technical Report.

Booklists

Please see the Booklist for Part IIA Courses [6] for references for this module.

Examination Guidelines

Please refer to Form & conduct of the examinations [7].

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Links
[1] mailto:jah249@cam.ac.uk
[2] mailto:j.howard-grenville@jbs.cam.ac.uk
[3] http://www.withbotheyesopen.com/read.php
[4] https://sdgcompass.org/
[5] http://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/
[6] https://www.vle.cam.ac.uk/mod/book/view.php?id=364091&chapterid=261762
[7] https://teaching19-20.eng.cam.ac.uk/content/form-conduct-examinations