**TEACHING MODULE**

**SYLLABUS**

The purpose of this syllabus is to create a coherent information card that will give first preliminary/general information for the recipient of the TECHENER PROJECT products of the content of an individual teaching module. Such a syllabus should be filled/created for each teaching module resulting in 8 syllabuses. If it is decided, that a given TM will have advancement levels (ex. beginner, intermediate, advanced), three syllabuses should be created (similar but with proper extensions of extra materials, topic, subject matter, etc.).

1. **Name of the Teaching Module**
Social Impact of Energy Technologies. Assessing social impacts through Social Life Cycle Assessment (SLCA)
2. **Brief description of the subject matter**

Strategies are being developed on the local and global levels to enhance energy security and sustainability through innovative energy policies and measures. The need for practical and sustainable solutions has led to the development of sustainability measurement tools, such as Life Cycle Assessment (LCA). Life cycle assessment (LCA) is widely used for decision support, but it is mainly limited to environmental impacts and fails to address the other dimensions of sustainability - social and economic concerns - in the product life cycle.

As a step further, social criteria may also be included in the sustainability assessment analysis, through the Social Life-Cycle Assessment (SLCA), a tool that analyses the impact on society of products or services throughout their life-cycle, assessing the actual and potential positive and negative impacts. Research on standardization of a methodology for conducting SLCA is limited compared to LCA but it is still ongoing.

The module aims to introduce the SLCA methodology as a tool to measure the main social impacts of energy projects through a life cycle perspective.

1. **Complete SSH problems description**
* Social indicators are currently being considered for energy projects, along with the technical, economic and environmental aspects. However, the overall social impact on local and global scale is hardly addressed by most currently used methods for social evaluation in the energy field.
* Although some Social Assessment tools exist, most of them lack the global perspective of considering the whole Life Cycle of the product or service.
* Social Life Cycle Assessment, a tool that fills the gap, doesn’t have yet an established methodology. Research on the standardization of a methodology for conducting SLCA is going on but still incipient.
* Very few cases of application of SLCA framework to the provision of energy services and in to the energy sector in general
* For SLCA, quantitative and qualitative social impact indicators are needed which are usually difficult to obtain and most of the times subjective.
1. **Prerequisites and context**

Students can benefit of a previous familiarity with LCA methodology, though it is not essential.

This module is complementary of the ‘Technology Assessment’ module developed by UFZ, where SLCA is explained and an exercise proposed for students based on developing a SLCA for geothermal energy application. The Technology Assessment module provides a general overview of LCA which may be useful to undertake before this module if students are not familiar with LCA.

1. **Learning outcomes**
2. Knowledge
	1. students will be able to grab the importance of SLCA and contextualize the methodology;
	2. students will learn the steps needed to design and conduct a SLCA;
	3. students will be able to explain the characteristics of a suitable sustainability indicator framework;
	4. students will be aware of the difficulties in obtaining values for indicators on social themes;
	5. students will be able to provide compelling examples of the importance of social issues in real energy projects at different scales.
3. Skills
	1. Students will be able to understand the design of a SLCA;
	2. students will be able synthetize the findings in a report;
	3. students will be able to define a number of sustainability indicators;
	4. students will be able to estimate values for social indicators.
4. Social competencies
	1. Students will be able work in teams in a collaborative atmosphere;
	2. students will be able to discuss/debate ideas with an open mind.
5. **Form of classes**

This module is divided into two sessions.

1. The first session (1 h 30’) is a lecture introducing SLCA, which contains a group work on social indicators
2. In the second session (2 h 15’), the students working in teams will develop a SLCA based on a case study introduced at the end of the first session.

Students will read some aspects of the case study using the provided reading material between the two sessions and will prepare, in teams, a presentation to be shown at the beginning of the second session.

At the end of the second session, students need to compile, as a homework, their analyses in a report.

1. **Teaching methods**
* Lecture
* Power Point Presentation
* Group work
* Discussion.
1. **General classes plan**
2. Session 1: Introduction – SLCA (2x45 min): Sustainability Assessment, Social Assessment Methods, Indicators, Introduction to Life Cycle Assessment, Social LCA methodology, SLCA case studies in the energy field,
	* 1. 10 min introduce of the concept of sustainability assessment by the teacher, stressing its important in the energy field.
		2. 30 min Presentation and group work on indicators.
		3. 30 min Introduction to Life Cycle Assessment, to the Social Assessment Methods, and to the SLCA Methodology.
		4. 15 min SLCA case studies in the energy field, which exemplify the usefulness of the approach.
		5. 10 min preparation for session 2
	1. Session 2 Develop a S-LCA analysis (3x45)
		1. 20 min presentation of the case study (by a team of students)
		2. 5 min remainder by the teacher of the basic SLCA steps.
		3. 95 min Workshop on SLCA development following the main framework (group work on different aspects, and open discussions)
		4. 15 min final discussion on the quality of the work done and the limitations of the methodology.

Material needed

Power point presentation + computer + additional files provided with the TM

Printed Handouts for the activity in the first session (if students don’t bring their laptops)

For the second session students should bring at least one laptop per team (in this case, all the handouts can be used in their electronic form).

1. **TM assessment methods & criteria**

**IGNORE THIS POINT FOR THE TIME BEING.**

1. **Literature and other materials**

Sustainability assessment

1. Bhandari, R.; Saptalena, L. G.; Kusch, W. (2018) Sustainability assessment of a micro hydropower plant in Nepal. Energy, Sustainability and Society 8:3.
2. Didem Dizarglu: The role of indicator-based sustainability assessment in policy and the decision-making process: a review and Outlook Sustainability 2017, 9, 1018; doi:10.3390/su9061018
3. Freudenburg, W.R. 1986: Social impact assessment. Ann Rev Sociol 12, 451-478.
4. Ness, B., Urbel-Piirsalu, E., Anderberg, S., Olsson, L. (2007) “Categorising tools for sustainability assessment” Ecological Economics 60, 498 – 508.
5. Waas, T.; Hugé, J.; Block, T.; Wright, T.; Benitez-Capistros, F.; Verbruggen, A. Sustainability assessment and indicators: Tools in a decision-making strategy for sustainable development. Sustainability 2014, 6, 5512–5534.

Social Life Cycle assessment

1. Ciroth, A., Eisfeldt, F. (2016), “PSILCA – A Product Social Impact Life Cycle Assessment database. Documentation”, Available from: <https://nexus.openlca.org/ws/files/9062>
2. Petti, L., Serreli, M., Di Cesare, S. (2016) Systematic literature review of social life cycle assessment. International Journal Life Cycle Assessment 23 (3), 422-431.
3. Sala, S., Vasta, A., Mancini, L., Dewulf, J., Rosenbaum, E. „Social Life Cycle Assessment – State of the art and challenges for supporting product policies“ (2015) JRC Technical Report. EUR 27624EN; doi: 10,2788/253715. Joint Research Centre (JRC). Available from: https://ec.europa.eu/jrc/en/publication/social-life-cycle-assessment-state-art-and-challenges-supporting-product-policies

Guidelines

* 1. UNEP-SETAC, United Nations Environment Programme (UNEP) (2009), Guidelines for social life cycle assessment of products. UNEP/SETAC Life Cycle Initiative. Available at: <http://www.unep.org/pdf/DTIE_PDFS/DTIx1164xPA-guidelines_sLCA.pdf>
	2. UNEP-SETAC (2013) The methodological sheets for subcategories in Social Life Cycle Assessment. Available at: <https://www.lifecycleinitiative.org/wp-content/uploads/2013/11/S-LCA_methodological_sheets_11.11.13.pdf>

Case Studies

* 1. E. Ekener-Petersen, J. Höglund, and G. Finnveden, “Screening potential social impacts of fossil fuels and biofuels for vehicles,” Energy Policy, vol. 73, pp. 416–426, 2014.
	2. Yi Fan, Ruqun Wu, Jiquan Chen, Defne Apul (2015): A Review of Social Life Cycle Assessment Methodologies, in: Muthu, Subramanian Senthilkannan: Social Life Cycle Assessment. an insight. Springer Science+Business Media: Springer.
	3. Y. Manik, J. Leahy, and A. Halog, “Social life cycle assessment of palm oil biodiesel: A case study in Jambi Province of Indonesia,” Int. J. Life Cycle Assess., vol. 18, no. 7, pp. 1386–1392, 2013. 10.
	4. J. Ren, A. Manzardo, A. Mazzi, F. Zuliani, and A. Scipioni, “Prioritization of bioethanol production pathways in China based on life cycle sustainability assessment and multicriteria decision-making,” Int. J. Life Cycle Assess., vol. 20, no. 6, pp. 842–853, 2015.
	5. B. Rugani, E. Benetto, E. Igos, G. Quinti, A. Declich, and F. Feudo, “Towards prospective life cycle sustainability analysis: exploring complementarities between social and environmental life cycle assessments for the case of Luxembourg’s energy system,” Matériaux Tech., vol. 102, no. 6–7, p. 605, 2014
	6. M. Traverso, F. Asdrubali, A. Francia, and M. Finkbeiner, “Towards life cycle sustainability assessment: An implementation to photovoltaic modules,” Int. J. Life Cycle Assess., vol. 17, no. 8, pp. 1068–1079, 2012.
	7. F. S. Weldegiorgis and D. M. Franks, “Social dimensions of energy supply alternatives in steelmaking: Comparison of biomass and coal production scenarios in Australia,” J. Clean. Prod., vol. 84, no. 1, pp. 281–288, 2014.