



Assessing social impacts in a life cycle perspective—Lessons learned

M.Z. Hauschild (2)^{a,*}, L.C. Dreyer^{a,b}, A. Jørgensen^a

^a Department of Management Engineering, Technical University of Denmark, Lyngby, Denmark

^b Brødrene Hartmann A/S, Lyngby, Denmark

ARTICLE INFO

Keywords:

Lifecycle
Sustainable development
Social impacts

ABSTRACT

In our globalised economy, important stakeholder groups nowadays hold companies responsible for the social impacts they cause in their product chain through activities like child labour, corruption or discrimination of employees. Many companies thus see themselves in need of a tool which can help them make informed decisions about their social impacts throughout the life cycle of their products. The paper presents lessons learned from four years of work with industry on development of a methodology for Social Life Cycle Assessment and implementation in the industrial product chain. The Social LCA methodology supplements the traditional environment-oriented LCA and the life cycle costing tools in support of sustainability management addressing all three pillars of sustainability: people, planet and profit.

© 2008 CIRP.

1. Introduction

A company has the possibility to influence the actions of the different actors along its product chains, back in the supply chain to its suppliers and their suppliers, and forth to the customer and user, and to the disposal or recycling of its products (Fig. 1). This possibility entails responsibility for a sustainable company, and Life Cycle Assessment (LCA) is thus a relevant analytical tool for sustainable engineering and management introducing the necessary life cycle perspective [1].

In our globalised economy, important stakeholder groups nowadays hold companies responsible for the social impacts they cause in their product chain through activities which may involve child labour, corruption, discrimination and deprivation of employees of their right to organize and demand fair working conditions. Often, these impacts occur far from the company headquarters, typically upstream in the product chain, but examples exist where globalised corporations have been held responsible by media and Non-Governmental Organisations for poor working conditions, not only in their own facilities, but also at their suppliers. The damage to their brand can be substantial, and for companies who claim to be sustainable, sometimes irreparable. This inspires companies to broaden their traditional focus on shareholders to include a wider range of stakeholders through adherence to voluntary sustainability principles like the Organisation on Economic Co-operation and Development, OECD's Guidelines for Multinational Enterprises [2], the United Nation's Norms on the Responsibilities of Transnational Corporations with Regard to Human Rights [3], the International Labour Organisation (ILO) Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy [4] or the United Nation's Global

Compact [5]; through participation in Social Reporting Initiatives such as Global Reporting Initiative [6], or through application of Management systems, such as SA8000 [7].¹ Issues like discrimination, child labour, corruption and fair working conditions all reflect the company ethics, and there is a need for a tool which can help companies prioritise their efforts in minimising social impacts throughout the life cycle of their products.

LCA methodology has been developed over the last decades to focus on the environmental impacts [1], and the basic principles of Environmental LCA have been set in international standards [8,9]. Sustainability is, however, commonly recognized as having three dimensions [10]:

- Environmental sustainability.
- Economic sustainability.
- Social sustainability.

Tools also exist for addressing the economic dimension of sustainability along the product chain, e.g. in Life Cycle Costing [11,12], but work on assessments of the social impacts in a life cycle perspective is rather recent and has gained momentum only over the last years [13–15].

The authors have been involved in the work with Social LCA ([15–17]), and here report on some of the central lessons learned so far.

2. Lessons learned

Experience from Environmental LCA has inspired the development of the Social LCA methodology. The focus is still on the product, and for many applications, the methodology should allow

* Corresponding author.

¹ Additionally, ISO is currently working on a standard on social responsibility (ISO 26000).

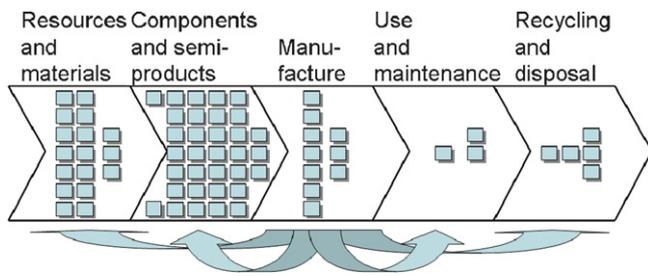


Fig. 1. A company has the possibility to exert influence on the other actors in its value chain.

aggregation of impacts over the whole life cycle. Sometimes there are trade-offs between social and environmental impacts, an activity which improves the social impacts may worsen the environmental impacts and vice versa. When this is the case, it is helpful if the analytical methodologies for social and environmental impacts are consistent and compatible so the social and environmental impacts may be brought on a comparable scale.

2.1. Different uses require different tools

Like the Environmental LCA, Social LCA has been mentioned and used in a number of different application types:

- Sustainability labelling of products or services.
- Sustainability management in a life cycle perspective [16,18].
- Sustainability assessment of technology choices [19].

The different scopes pose different requirements to the methodology and even within one application type there may be a diversity of needs. The company working with management of the social impacts in its product chains may thus need tools ranging from simplified tools of little data requirement for screening of potential suppliers or of the whole product chain in order to detect potential hot spots, to more comprehensive and data-requiring tools for detailed assessments and documentation of the improvements made in the life cycle of the products. Rather than one tool, the company needs a toolbox with tools addressing a variety of needs in the management practice. It is essential that these tools be calibrated against each other so they all indicate the same direction for social sustainability.

2.2. Importance of local specificity

From Environmental LCA the difficulty of addressing very locally dependent impacts is well-known. The local dependence means that the assessment requires site specific information about the local environment or the conditions under which a process is operated. Considering the number of sites potentially involved in the life cycle, the environmental life cycle impact assessment is normally done in a site-generic way, ignoring local or regional differences in environmental conditions and susceptibilities [20]. Inventory information is largely based on generalised unit process data, and specific data is only collected for the most dominating processes in the product chain [21]. The most local impacts of all, the human health impacts from exposure of the workers which operate the production equipment, with a strong dependence on the actual conditions of the process, are typically not included.

Social impacts are also strongly influenced by local conditions, in particular by the company's actual behaviour, and it is therefore necessary to collect specific data for the companies in the product chain. This is a cumbersome task, particularly for the companies far back in the product chain, (the suppliers of the suppliers, etc.) where one will typically have to resort to generalised data, e.g. based on location of the company and line of industry. This is also why simplified screening tools are needed in the Social LCA toolbox to identify the hot spots of the product chain and focus the effort in data collection on these parts of the product chain, where social

impact can be severe and where more detail is needed in the analysis.

2.3. Which impacts and how to quantify them?

In Environmental LCA, the impact assessment addresses the impacts which the product system's emissions and resource extractions have on a number of Areas of Protection, which in Environmental LCA are [22]:

- Human health.
- Natural environment.
- Natural resources.
- Man-made environment.

While some of these are also relevant as Areas of Protection for the impact assessment in Social LCA (notably human health, which may be strongly influenced by the social impacts of a company), it is clear, that they do not fully cover what we want our Social LCA to address. An additional Area of Protection is needed covering Human Dignity and Well-being, representing the value of a good and decent life enjoying respect and social membership and with fulfilment of the basic needs (access to food, water, clothes, medical care, ...) [16,23].

These Areas of Protection help us identify the types of impacts which are relevant to consider in a Social LCA. Considering the local nature of social impacts, the relevant impacts may differ from company to company in the product chain. To ensure the relevance of the Social LCA as a decision support tool, it must adapt to the actual context by considering impacts which are specific to the product or sector of industry, and to the company itself. Griefshammer et al. [14] see the participation of stakeholders in the definition of indicators to address as preferable. On the other hand, the methodology must also include social assessment parameters that express some minimum expectations to a responsible conduct of business. The Social LCA therefore has to address two types of impact categories, an obligatory and predetermined set of categories which represents minimum requirements to conducting responsible business, and an optional, self-determined set which expresses interests specific to the product manufacturer [16].

In order to facilitate international consensus on the obligatory impact categories, they are typically based on the Universal Declaration of Human Rights [24] as it has been translated into global workers rights by the International Labour Organisation in its conventions [25] and in the Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy [4]. Examples of obligatory impact categories are [16]:

- Discrimination.
- Child labour.
- Forced labour.
- Freedom of association.

Whereas the obligatory impact categories are seen as truly universal, the optional impact categories are much more dependent on the context of the company in terms of geographical and cultural settings, and they also may vary from trade to trade. Examples of optional impact categories are [15,16]:

- Physical working conditions.
- Working hours.
- Minimum wage and benefits.
- Training and education of employees.
- Development support towards local society.

From Environmental LCA we are used to measure only negative impacts on the environment. The product itself may be beneficial to the environment, but the emissions and resource uses that it causes throughout its life cycle only have negative impacts. This is

different for Social LCA. Manufacturing can be an important social activity accompanied by creation of wealth in the local community through payment of workers and purchase from local suppliers, training of workers, improvement of health among workers and their families, etc. If performed in an unethical manner it may also have strongly negative social impacts, through infringement on the workers' rights, employment of child labour, distortion of local communities, use of bribery to create corruption, etc. The Social LCA must be able to address as well the positive as the negative impacts.

In Social LCA, the impacts may be quantified using indicators which allow aggregation across the entire life cycle in accordance with the ISO requirements known from Environmental LCA [8,9]. Different approaches are used for quantification of the different social impacts. Some of the positive impacts may be directly quantified but for the negative impacts, and in particular in the obligatory categories, a direct quantification is often not meaningful. Violations of labour rights can be difficult to prove, and the absence of reported infringements or complaints may tell more about inefficient book-keeping than of the quality of the work environment. Instead, the risk that negative impacts occur may be gauged from the way that the company manages the relevant activities as proposed by [16].

2.4. Relating social impacts to the product

In Environmental LCA the focus is on the environmental impacts from the product system. These are caused by physical flows, and the Life Cycle Inventory collects and aggregates information about physical flows to and from all the processes in the life cycle. Resources, materials and (semi)products enter, and emissions and (semi)products leave the system. The fundamental unit of the product system in Environmental LCA is the process, since this is where the actual physical flows are determined.

Social LCA addresses social impacts, and these are not determined by physical flows but by the way, a company treats the people, it interacts with—its stakeholders. In Social LCA, it is therefore the company rather than the process which is the fundamental unit, and the inventory analysis is focused on the conduct of the company towards its stakeholders (see Fig. 2).

Once evaluated, the social impacts of the different companies in the product chain must be allocated to the product. In Environmental LCA the relationship between the process and the product is of a physical nature: How large emissions and resource consumption are caused by the processing of the product? The aggregation of the contributions from the individual processes to a total for the life cycle thus follows simple physical rules in Environmental LCA.

In Social LCA it is less straightforward to link the behaviour of the individual companies in the product chain to the product in a quantitative way. Nevertheless, it is indispensable to decide the weights given to each supplier in order to aggregate the social impacts over the life cycle. It is clear that the performance of companies, which play a large role in the life cycle, should influence the product's total impact more than companies which only contribute little to the product, but how to measure the contribution? There is not one objective answer to this question, but a number of possibilities can be listed:

- Physical weight—the contribution to the physical weight of the product.
- Cost—the contribution to the cost of the product.
- Value creation—contribution to the product's value.
- Working hours—the time spent on the product.

The parameter on which to base the weight given to each individual company must meet two criteria. First it must be possible to get the information needed to determine the parameter for all companies in the product chain. Second, and most

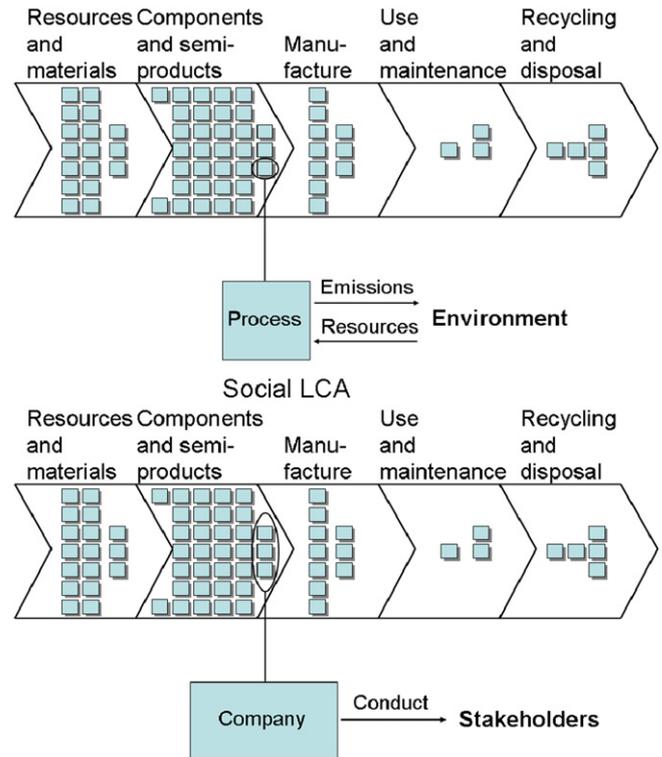


Fig. 2. In Environmental LCA focus is on the individual processes and the physical flows which they exchange with the environment. In Social LCA focus is on the company and the impact that its conduct has on the stakeholders (adapted from [16]).

important, the parameter must be relevant in a calculation of the social impacts of the product.

The first proposal, the physical weight, clearly meets the first criterion and just as clearly fails the second. The weight of the different parts of the product cannot be justified as a relevant allocation criterion in a Social LCA.

Both the second and third proposal can be seen as relevant allocation parameters in a Social LCA. It seems fair that the companies which contribute most to the value creation or to the accumulation of costs along the product chain are also the companies which should influence the social profile of the product the most. As regards the information needed for these parameters, cost information can be sensitive for a company to pass on to its customers, and the value creation can be difficult to assess in a consistent way for each link in the product chain.

3. Conclusion

With the globalisation of production, even simple products often involve companies which operate in parts of the world where the social impacts of their activities can be serious. Particularly producers of consumer goods, who wish to protect their brand in a very sensitive market, develop a natural focus on corporate social responsibility, CSR, and broaden the focus to sustainability rather than just environment.

Furthermore, there are often conflicts between environmental improvements and social impacts. Outsourcing of parts of the production to developing economies will thus normally lead to worse environmental impacts since environmental regulation and infrastructure will be weaker or completely absent in the developing economies. On the other hand, the outsourcing creates jobs and trains local workers, and employment leads to increased welfare in the local economy. These are the two sides of economic growth, and if we only look at the environmental impacts, we miss the full picture. The economic growth caused by outsourcing of production to a developing economy may be positive even from a narrow environmental perspective, if the

outsourcing is done in a responsible way. The increase in welfare and material security will allow the local citizens to act in a more sensible way rather than erode their local environment in an attempt to meet their immediate needs. Nonetheless, very little work has so far been performed on the development or application of Social LCA, which is crucial to allow companies to fully consider sustainability. Several projects are, however, ongoing (see [15] for a review) and finalised methodologies are still to be presented. Under the joint Life Cycle Initiative of the United Environment Program, UNEP and the Society of Environmental Toxicology and Chemistry, SETAC to 'develop and disseminate practical tools for evaluating the opportunities, risks, and trade-offs associated with products and services over their whole life cycle' [26], a task force has been dedicated to the discussion of and establishment of consensus on the methodology for Social LCA [14].

References

- [1] Hauschild MZ, Jeswiet J, Alting L (2005) From Life Cycle Assessment to Sustainable Production: Status and Perspectives. *Annals of the CIRP* 54(2):535–556.
- [2] Organisation for Economic Co-Operation and Development (OECD) (2000) The OECD Guidelines for Multinational Enterprises, <http://www.oecd.org/dataoecd/56/36/1922428.pdf>.
- [3] United Nations. Economic and Social Council (2003) Draft Norms on the Responsibilities of Transnational Corporations and Other Business Enterprises with Regard to Human Rights. Adopted by Sub-Commission on the Promotion and Protection of Human Rights at its 22nd meeting, August 2003, <http://www1.umn.edu/humanrts/links/NormsApril2003.html>.
- [4] International Labour Organisation. (2001) *Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy*. Third edition. International Labour Office, Geneva, Switzerland.
- [5] UN Global Compact, www.globalcompact.org.
- [6] Global Reporting Initiative (GRI) (2006) Sustainability Reporting Guidelines (Draft) – G3 Version for public comment 2 January 2006–31 March 2006, Indicator Protocols, <http://www.grig3.org/pdf/HR.pdf>.
- [7] Social Accountability International (SAI) (2001) Social Accountability 8000, New York 2005.
- [8] ISO 14040 (2006) International Standard. Environmental management – Life cycle assessment – Principles and framework, International Organisation for Standardisation, Geneva.
- [9] ISO 14044 (2006) International Standard. Environmental management – Life cycle assessment – Requirements and Guidelines, International Organisation for Standardisation, Geneva.
- [10] Elkington J (1998) *Cannibals with Forks—The Triple Bottom Line of 21st Century Business*. New Society Publishers, Canada.
- [11] Norris G (2001) Integrating Life Cycle Cost Analysis in LCA. *International Journal of Life Cycle Assessment* 6(2):118–120.
- [12] Rebitzer G, Hunkeler D (2003) Life Cycle Costing in LCA: Ambitions, Opportunities, and Limitations. *International Journal of Life Cycle Assessment* 8(5):253–256.
- [13] Casado Cañeque F (2002) Evaluación de la situación laboral de empresas: El análisis del ciclo de vida como herramienta para el desarrollo sostenible, Ph.D. thesis, Universitat de Barcelona, Divisió de Ciències Jurídiques, Econòmiques i Socials, Barcelona.
- [14] Griefhammer R, Benoît C, Dreyer LC, Flysjö A, Manhart A, Mazijn B, Méthot A, Weidema BP (2006) Feasibility Study: Integration of Social Aspects into LCA, Discussion Paper from UNEP-SETAC Task Force Integration of Social Aspects in LCA meetings in Bologna (January 2005), Lille (May 2005) and Brussels (November 2005), Freiburg, Germany.
- [15] Jørgensen A, Le Bocq A, Nazarkina L, Hauschild MZ (2007) Methodologies for Social Life Cycle Assessment—A Review. *International Journal of Life Cycle Assessment* 13(2):96–103.
- [16] Dreyer LC, Hauschild MZ, Schierbeck J (2006) A Framework for Social Life Cycle Impact Assessment. *International Journal of Life Cycle Assessment* 11(2):88–97.
- [17] Dreyer LC, Hauschild MZ (2006) Scoping Must Be Done in Accordance With the Goal Definition, Also in Social LCA. *International Journal of Life Cycle Assessment* 11(2):87.
- [18] Méthot A (2005) FIDD: A green and Socially Responsible Venture Capital Fund. Presentation on the Life Cycle Approaches for Green Investment – 26th LCA Swiss Discussion Forum, 2005, Lausanne, Switzerland.
- [19] Schmidt I, Meurer M, Saling P, Kicherer A, Reuter W, Gensch C (2004) SEEBalance—Managing Sustainability of Products and Processes with the Socio-Eco-Efficiency Analysis by BASF. *Greener Management International* (45):79–94.
- [20] Potting J, Hauschild M (2006) Spatial Differentiation in Life Cycle Impact Assessment—A Decade of Method Development to Increase the Environmental Realism of LCIA. *International Journal of Life Cycle Assessment* 11(Special Issue 1):11–13.
- [21] Wenzel H, Hauschild MZ, Alting L (1997) *Environmental Assessment of Products. Vol. 1—Methodology Tools and Case Studies in Product Development*. Chapman & Hall/Kluwer Academic Publishers, United Kingdom/Hingham, MA, USA, ISBN 0 412 80800 5.
- [22] Udo de Haes HA, Jolliet O, Finnveden G, Hauschild MZ, Krewitt W, Müller-Wenk R (1999) Best Available Practice Regarding Impact Categories and Category Indicators in Life Cycle Impact Assessment. Background Document for the Second Working Group (WIA-2) on Life Cycle Impact Assessment of SETAC-Europe (continued). *International Journal of Life Cycle Assessment* 4(2):66–74; Udo de Haes HA, Jolliet O, Finnveden G, Hauschild MZ, Krewitt W, Müller-Wenk R (1999) Best Available Practice Regarding Impact Categories and Category Indicators in Life Cycle Impact Assessment. Background Document for the Second Working Group (WIA-2) on Life Cycle Impact Assessment of SETAC-Europe. *International Journal of Life Cycle Assessment* 4(3):167–174.
- [23] Weidema BP (2006) The Integration of Economic and Social Aspects in Life Cycle Impact Assessment. *International Journal of Life Cycle Assessment* 11(Special Issue 1):89–96.
- [24] UNHCHR. United Nations High Commissioner for Human Rights (1997) The Universal Declaration of Human Rights: A Magna Carta for All Humanity, United Nations Department of Public Information DPI/1937/A, December 1997.
- [25] International Labour Organisation: Conventions and Recommendations, ILO-LEX, www.ilo.org.
- [26] UNEP (2006) Life Cycle Initiative homepage: <http://www.uneptie.org/pc/sustain/lcinitiative/home.htm>.