

QUALITATIVE EVALUATION OF LIFE CYCLE ASSESSMENT STAKEHOLDERS REQUIREMENTS IN SPAIN

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Life Cycle Assessment (LCA) is a tool for the systematic evaluation of the environmental aspects of a product, process, or system through all stages of its life cycle. ISO standards describe the requirements to do a LCA study, which indicates that in defining the scope and objective of an study should clearly manifest product features.

The selection of inputs and outputs, the level of aggregation within a category of data and system modeling should be consistent with the study objective. The system should be modeled so that the inputs and outputs at its boundaries are elementary flows.

To do a LCA study is necessary data to analyse and calculate the impacts of some product, process or services. The dependence from stakeholders is very big, because to get all information considered by LCA expert is a laborious work and not always possible to achieve.

This paper present the result of 20 interviews from LCA experts in Spain, whose goal is identify qualitatively the requirements to do a LCA study. This requirements was transformed in categories to facilitate its further assessment and validation.

Keywords: Life Cycle Assessment; stakeholders; qualitative analysis; requirements

EVALUACIÓN CUALITATIVA DE LOS REQUERIMIENTOS DE LAS PARTES INTERESADAS EN LOS ANÁLISIS DE CICLO DE VIDA (ACV) EN ESPAÑA.

El Análisis de Ciclo de Vida (ACV) es una herramienta para la evaluación sistemática de los aspectos medioambientales de un producto, proceso o sistema en todas las etapas de su ciclo de vida. Las normas ISO establecen los requisitos para hacer un estudio de ACV, debiendo quedar claramente definidos el alcance, los objetivos del estudio y las características del producto analizado.

La selección de entradas y salidas, el nivel de agregación dentro de una categoría de datos y modelado del sistema debe ser consistente con el objetivo del estudio. El sistema debe ser modelado de manera que las entradas y salidas de sus límites queden definidos como flujos elementales.

Para analizar y calcular los impactos de un producto, proceso o servicio resulta fundamental disponer de datos lo más precisos posible. La colaboración de las partes interesadas es muy grande, porque de ellos depende facilitar gran parte de la información requerida por los expertos en ACV.

En este trabajo se presenta el resultado de 20 entrevistas a expertos de ACV en España, cuyo objetivo es identificar cualitativamente los requisitos para hacer un estudio de ACV. Estos requisitos se procesan en categorías para facilitar su posterior evaluación y validación.

Palabras clave: Análisis de ciclo de vida; partes interesadas; análisis cualitativo; requisitos

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1. Introduction

Life cycle assessment (LCA), as a strongly and comprehensive analytical tool, has been widely used for assessing environmental impacts of products, process and systems during their whole life cycle (Cooper and Fava, 2006; Elcock, 2007; Maurice et al., 2000). In accordance with ISO 14040 standards, a complete LCA includes four interdependent steps: (i) goal and scope definition, (ii) inventory analysis, (iii) impact assessment, and (iv) interpretation of results. Among these four steps, the core quantitative analysis parts are inventory analysis and impact assessment. In general, life cycle inventory (LCI) analysis consists of compiling a list of cradle-to-grave inventory data by counting the balance flows involving inputs and outputs, such as materials and energies, during the entire life cycle of a product or system (Owens, 1997a).

Therefore, the purpose of the current paper is to identify clearly how is the dissemination and development of LCA by industrial experts in Spain. Other view is to identify how is the communication and the process of study of this tool. Furthermore the contribution of this paper is to understand whether or not these requirements answer the criticality challenges in an LCA compliant manner and what are the possible bridges and further research needs in order to enable an efficient integration and communication between networks and individuals LCA stakeholders, considering the current Spanish situation.

1.1. Stakeholder: early concept and approach

The term stakeholder was described and used as a literary to call into question management sole emphasis on *stockholders* (Freeman, 1984) and instead suggested that the firm be responsible to a variety of stakeholders, and that, without their support, the organizational would not survive (Preble, 2005). Freeman (1984), identify that corporations began responding to a more dynamic and uncertain external environment by setting up formal environmental scanning systems (Preble, 1978). In develop this system, Freeman call for managers to apply their conceptual maps and use the stakeholders framework to help interpret external events.

By definition, stakeholders in an organization is an individual or any group that can affect or be affected by the achievement of the institutions objectives, and for Freeman this is important in highlighting a two-way relationship between company and the stakeholders. Stakeholders can impact whether or not the institution and its managers will achieve their objectives and, therefore stakeholders should be managed instrumentally, if profits are to be maximized. In other way, if the institutions affect the well-being of stakeholders then managers have a normative obligations to stakeholders that is moral in nature (Berman et al., 1999).

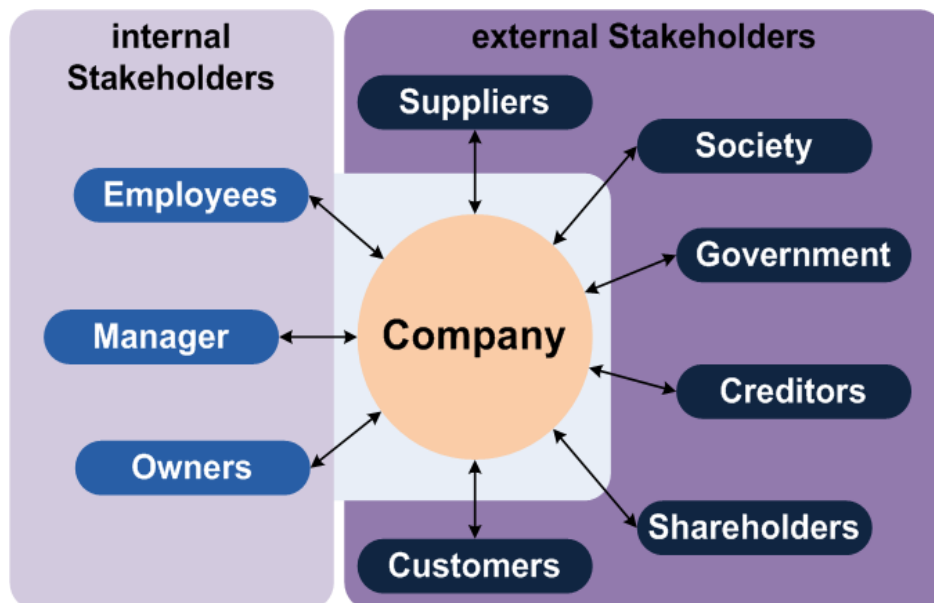
The Institutions survive depending on the continue participation of the primary and secondary stakeholders, e.g., for the primary, employers investors, customers and suppliers, for the secondary stakeholders are those who influence or affect, or are influenced or affected by corporations, but are not engaged in direct transactions with it and are not essential for its survival (Freeman, 1984 and Clarkson, 1995). This general concept and application is also

applied to Life Cycle Assessment (LCA) stakeholders. These secondary groups are not essential to basics functions of the organizations, but can strongly influence how companies are perceived for governments and public institutions and, therefore, have major impact on any life cycle analysis process or life cycle assessment on an organizational through the interactions of stakeholders (fig. 1).

While the actual literature on LCA stakeholders management discusses separately many elements of stakeholder management approach, surprisingly little effort has been made to develop a comprehensive and egalitarian model of stakeholder management. The synthesis of examples of LCA stakeholders, process identification and interest of each other will be used to identify requirements and how is the relationship of LCA stakeholders of industry experts in Spain, and is considered a major contribution of this paper.

Institutions and their managers must start using the stakeholder process models with the recognition that adopting a stakeholder perspective and purchase proactive stakeholders management techniques to improve and develop all connections ongoing fit to an ever changing external operating environment. In many cases of stakeholder management, is necessary identify all kinds of stakeholder that organization have and support each, according their own interest.

Figure 1: Stakeholder Map - Source: Freeman (1984).



2. LCA Stakeholders identification

Freeman's definitions of stakeholder is probably are the most used and cited. But this paper is oriented to identify the types of LCA stakeholders on industry and how is theirs requirements of data access and sharing information, internal and external, in the company. Many groups like

shareholders, consumers, users, trade union, workforce, etc, take their roles only in relation to an institution that server as a focal organization (Roloff, J. 2007).

According Wheeler (1998), there are two types of stakeholders: a primary, who have a direct stake in the organization and a secondary, whose stake is rather representational than direct, in other words, the primary stakeholder are those whose continuing participation is required if an organization is to survive and the secondary stakeholders are those influence or affect, or affected by, the institutions, but is not a very relevant in direct transactions with it and is not essential to organization survive (Clarkson, 1995). Some actors indicate that a public stakeholders is a intermediated stakeholders and can provide the companies with infrastructure, new environmental policy making and other kinds of legal frameworks in which to operate (Donaldson and Preston, 1995).

The identification and classification of LCA stakeholders is very important if the institution will develop a LCA study. Stakeholder decision or requirements are influenced by the importance of each aim by the study and which is a function of their power, legitimacy and urgency; which will distinguish among primary, second and non-stakeholders so that impact and efficiency of LCA studies can be better studied (Clement, 2005; Lim, Ahn & Lee, 2005; Boonstra, 2006).

3. Methodology

Ten strategic and semi-structured interviews of 20-25 minutes were held with industrial LCA experts in Spain. These interviews had a double purpose: (i) to collect their own definition of cropping system sustainability from a diversity of stakeholders, and (ii), to clarify stakeholders perception of database, communication and interpretation of LCA results (although the latter is not treated in this paper). The interviews were realized personally and VOIP system in all Spanish territory with the major references in LCA of this country.

All interviews were recorded and fully transcribed for later analysis. The data were analysed using content analysis with ATLAS.ti software. There are some important features in content analysis that distinguish it from other methodologies: it recognizes the importance of language; it is replicable and applicable, it is analytically flexible and, when properly conducted, it is a methodology that can be checked for its accuracy, reliability and validity (Duriáu et al., 2007; Krippendorf, 1980/2004).

For this paper we will analyse all questions from total questionnaire (table 1), and after discussion of the responses about how is the management and communication of LCA tool in Spain.

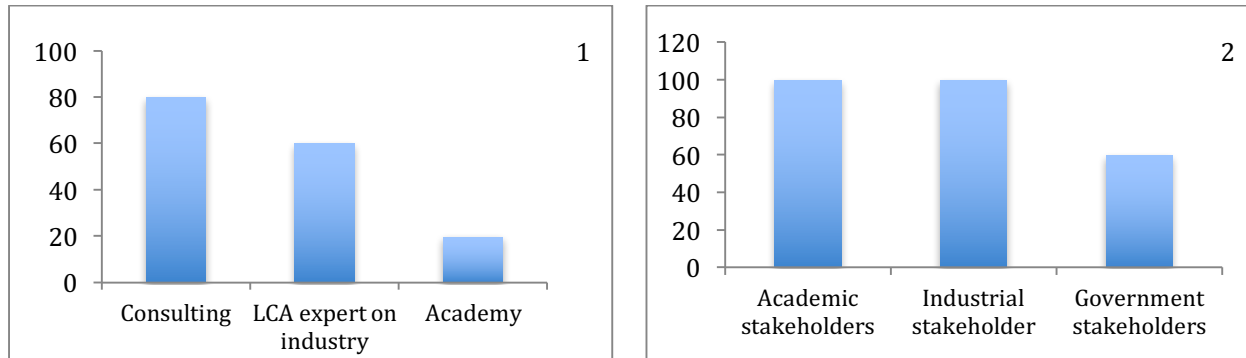
Table 1: List of standard questions to industrial LCA experts in Spain

	QUESTIONS	ASPECTS OF INTERVIEW QUESTIONS
1	What is your relationship with LCA?	Classify experts in focus group
2	How would most relates that has connection with LCA?	Identify stakeholder connexions
3	When participates or participated in a LCA, where search / sought information (people, organizations, companies, etc.)?	Know different requirements of stakeholders relationship
4	What difficulties did you find out this information search process?	Identify requirements and modelling of data from LCA experts
5	When you consider that the information is appropriate and how?	Identify when the data is suitable for the experts
6	When share information (data or results) with whom, how and for what does?	Classify aspects of sharing information with stakeholders
7	What restrictions / problems found in time to share the information (data and results)? Can arise problems in the process to share or problems in the information itself?	Sort aspects of sharing of data in LCA studies
8	Have you had problems with respect to environmental information that has a confidence? In this case how handled this situation?	Identify treatment of confidential information in a LCA analysis

4. Results and Discussion

In the first two questions (graphics 1 – 2): **1**-“What is your relationship with LCA?”; **2** – “How would most relates that has connection with LCA?”, asked in the interview have the objectives to identify the relationship of industrial LCA experts. The question 1 show that out of 10 interviewed 60% work inside the industry and 80% of experts work with consultancy (fig. 2). In other hand, 100% have connection with industrial and academic stakeholders of LCA. This can be justified because LCA are very interconnected with academy and the industrial stakeholders use a lot information from academy bibliography. Only 20% have direct connections in academy, acting as researchers or professors. We can see that the relationship with government stakeholder it is significative with 60% of interviewed.

Figure 2: Relationship of industrial LCA experts in Spain.

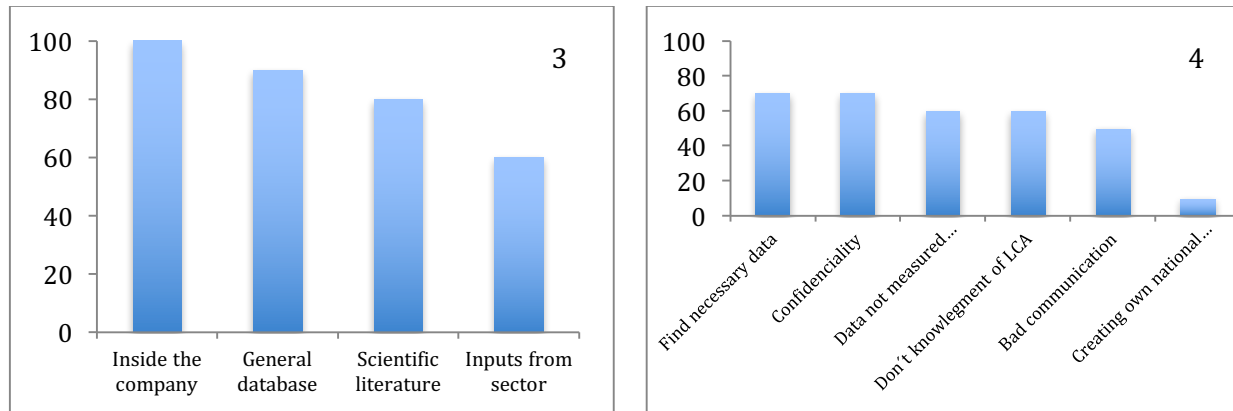


The next two questions (graphics 2 – 3) are: “ **3** - When participates or participated in a LCA, where search / sought information (people, organizations, companies, etc.?”; **4** – “What difficulties did you find in this information search process?”). They are about how the experts develop the environmental data collection to perform a LCA study. This is, probably, the more difficult part of LCA study, because the Inventory of Life Cycle (LCI) it’s the core of LCA. The interviewed asked that 100% get primary data inside the company, and 90% get the data from general data base, 80% from scientific literature and 60% get inputs from the sector of the company. This information, except the data from inside the companies is to compare and complement data. Depend of the quantity of external data to complement primary data, is necessary do sensibility analysis to average all data.

In accordance to the mentioned above, the figure 3 shows the graphic 4 that, according to the interviewed experts, the most difficulties/barriers to get necessary data it is exactly finding the data inside the company, (70%). This is because they already have the feeling of confidentiality of the internal data, (70%). In the other hand, when having data, for 60% of them, the companies do not have the data systematically measured, and for 60%, do not have any knowlegment of LCA.

One topic commented by interviewed was the bad communication about the environmental data both internally and externally to the company, 50%, of the experts claim to have bad communication when sharing the data. For this big problem, one of the interviewed advised than their group is creating their own South Europe database in collaboration with others stakeholders (fig. 3).

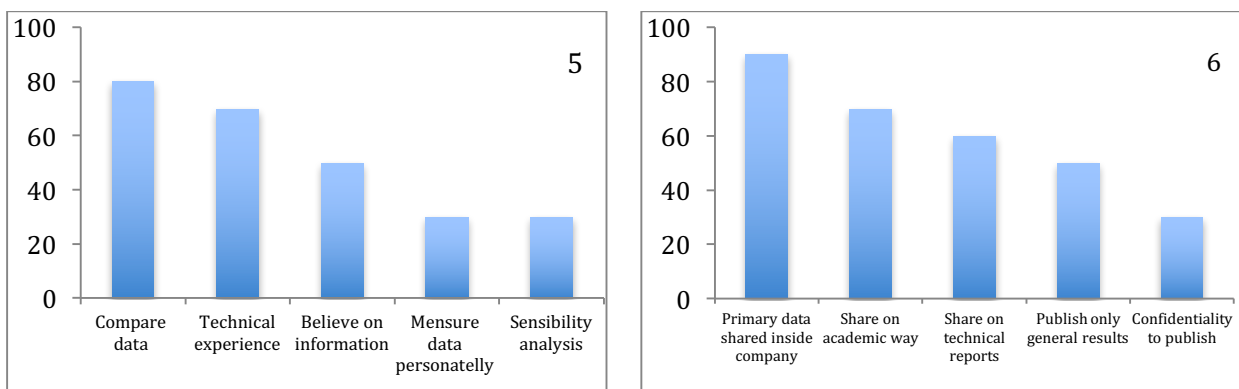
Figure 3: Information sharing process and difficulties/barriers to get necessary data.



This next two questions (graphics 5 – 6): **5** – “When you consider that the information is appropriate and how?”; **6** – “When share information (data or results) with whom, how and for what does?”, its about the perspective of each experts in relation of the quality of primary environmental data inside the company, and how is the sharing behaviour with all stakeholders. The results of this research show that 90% of experts need to compare the primary data with external data from many fonts. In this phase of study, we can see that the technical experience in LCA is considerate very important with 70%. For 50% of experts, only believe on information shared by the company it is enough to calculate the impacts.

According with graphic 4, for 30% its necessary measuring data of the studied company personally and 30% use a kind of sensibility analysis to check primary data (graphic 5), this is necessary to get a certified data and it is possible to confirm this necessity according graphic 4, where is showed that 60% of information is not systematically measured, and for 60%, do not have any LCA knowledge.

Figure 4: Consideration about quality and sharing of data.

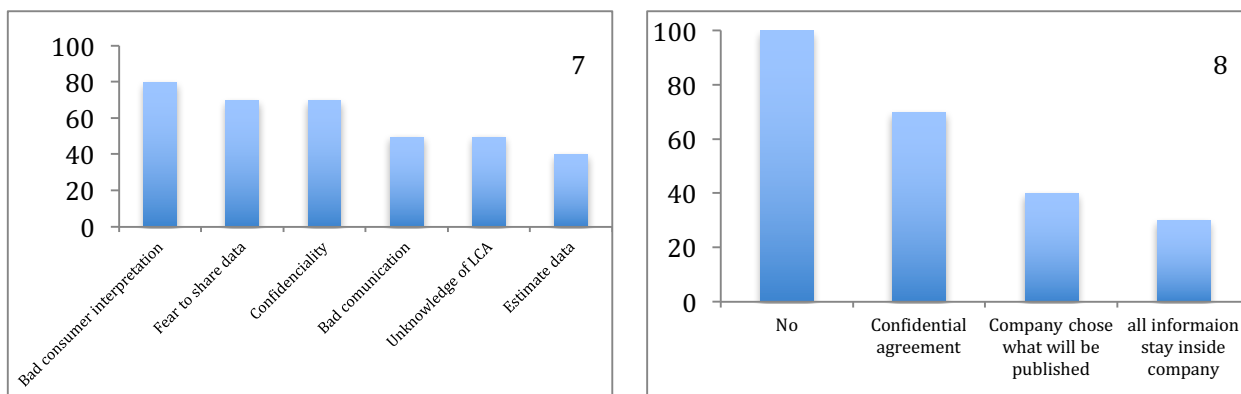


When they answer about data sharing (graphic 6), it is very sensible issue, because for 90% all primary data remains only inside the company, and for 70%, if authorized for the company, only the average of good results are published on scientific works and for 60%, the average of good results is published on technical reports for the governments or sectorial associations. For 30%, in all situations, always is forbidden sharing any data externally.

The last two questions (graphics 7 – 8): **7** – “What restrictions/problems found in time to share the information (data and results)? Can arise problems in the information sharing process or problems in the information itself?”; **8** – “Have you had problems with respect to environmental information that has a confidence? In this case how it is possible handle this situation?”, The answers focus about the importance of sharing data, for 80% of interviewed, the company does not publish their LCA study because few fear of the possible bad interpretation of consumers about the results, even positive one. Thus, 70% explain about the fear to share data and consequently come the confidentiality. One more time, the factor communication was cited, the bad communication (50%), followed of unknowledgment of LCA (50%), both within the company and with the final consumer it is a problem.

Finally, the last graphic (8) shows that nobody have had a problem with information, because 70%, always have had to sign a confidentiality agreement, and when they wanted publish some results, the company chose the information and how will be published.

Figure 5: Perception about confidential information and publishing results of LCA



5. Conclusions

The Life Cycle Assessment and Life Cycle Management it is a very powerful tool to study and make strategic decisions inside the company, but according with this short research about basic points of LCA, some barriers affect the explore fully this tool, like the culture of caution from the companies to share some data because the market and the consumers are not prepared to understand this kind of information and the effort of study their impacts to a possible improvement of process, could be back a negative marketing.

Nevertheless, some companies and environmental professionals are publishing more and more sustainability studies of their products because a growing percentage of consumers are asking for more environmental impact information and looking for a environmental friendly products.

To conclude, this short study about industrial LCA experts perception in Spain show us that the management of environmental information its growing, with their problems and barriers, but have more and more consciousness by industrial companies and by consumers. We can conclude that environmental tools like Life Cycle Assessment could complement the classic projects management and add value to an improvement of production process and consequently environmental and economic gains.

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