LCA – USE AND BARRIERS

Heimo Staller
IFZ, Inter-University Research Centre for Technology, Work and Culture, Schlögelgasse 2, A-8010 Graz, Austria, staller@ifz.tugraz.at

Wibke Tritthart
IFZ, Inter-University Research Centre for Technology, Work and Culture, Schlögelgasse 2, A-8010 Graz, Austria, tritthart@ifz.tugraz.at

Mónika Hajpál
ÉMI, Non-profit Ltd. for Quality Control and Innovation in Building, Diószegi út 37, H-1113 Budapest, Hungary, mhajpal@emi.hu

Summary

LCA (Life Cycle Assessment) provides a chance to assess the integrated performance of buildings over the whole life cycle. Clients and architects can use LCA as a decision support tool for building projects with ambitious ecological targets, for policy making and for public information. LCA provides serious, scientific and comparable data about buildings, building materials and building infrastructure.

But as a matter of fact LCA is not very wide spread. Even life cycle thinking – as a more general way of being aware of impacts through out the whole building life cycle – is not a common practice of many actors in the construction sector.

The background of this presentation is to ask for possibilities and chances that could take us some steps further towards integrating LCA-calculations into stakeholder decisions. We will describe the typical practice in European countries and its actors. Various methods of assessing environmental performance of buildings used in different countries will be presented. From this, evidence will derive what is meaningful and useful for practice in the construction sector as well as what are the chances and barriers for a broader uptake.

The presentation is part of the EU-FP 7 project "LoRe - Low Resource consumption buildings and construction by use of LCA in design and decision making" and the EIE project "ENSLIC_Build – Energy Saving in Buildings through Promotion of Life Cycle Assessment". These projects aim to contribute to an increased use of Life cycle analysis (LCA) as a method to gather, analyse, valuate and document comprehensive information on buildings and constructions with a specific focus on building's resource consumption (water, primary raw materials, energy, land) and waste generation.

Keywords: LCA, buildings, environment, resource consumption, sustainability

1 Introduction

Life cycle assessment (LCA) is a tool to systematically evaluate the environmental impacts and aspects of a product, a service, a production system or a service system through all

stages of its life cycle. Concerning buildings and construction work the whole life cycle of a building or a construction, ranging from acquisition of the raw materials and production of the building materials, to construction, use and deconstruction, is considered and impacts of all life cycle stages are assessed. In construction practice energy certifications have gained a lot of attendance because energy certification is demanded by the EBPD (Energy performance of buildings directive) in all member states of the EU. Thus much attention also of national and regional policies is focused on the energy consumption of buildings, e.g. subsidies are granted on the energy consumption during the use phase of a building.

Nevertheless energy consumption during the use phase reflects only one aspect of the total environmental performance consisting of other resource consumptions and environmental impacts via products as well as during the construction, during use and after the use of the building. LCA is providing this whole picture and thus is, after the energy certification, the next step to gain a comprehensive description of the environmental impacts of construction works. Although experts and stakeholders of the building sector broadly agree on this, LCA plays no important role in daily practice. In this paper the actual situation concerning the use of LCA with its barriers and hurdles in Europe, as well as strategies to overcome this situation will be highlighted.

2 Current situation of the construction practice in European countries concerning LCA

As a first results of the EU-projects LoRe [1] and ENSLIC [2] the situation concerning LCA in EU countries (with focus on the participating countries Austria, Bulgaria, France, Germany, Hungary, Norway, Spain and Sweden) was examined by the project partners. Legal requirements, voluntary instruments and everyday practice relevant to describe the situation was collected and is stated in the following chapters.

2.1 Legal requirements

There are no legal requirements for buildings in the above countries that are LCA-related in a comprehensive meaning; this means covering several impact categories and the whole life cycle. Requirements for the building permit are posed by the implementation of the EBPD in national building regulations, demanding an energy certificate for new buildings and refurbishments. Only energy and only the use phase of the building is affected, the annual energy consumption is reported, not the consumption assumable for the building's service life.

2.2 Housing subsidies and voluntary environmental requirements of clients

Housing subsidies are mentioned as an important driver for LCA assessments. In Austria housing subsidies require a simplified LCA of the building envelop materials based on the "Ecosoft-Tool"[1] and aggregated to the so called "OI3-Index".

Some clients have own demands on special LCA-related qualities like CO_2 reduction goals or have own checklists of hazardous products (Sweden[2], Germany). Of course,

[1] http://www.ibo.at/de/ecosoft.htm
[2] http://www.byggvarubedomningen.se

ecological demonstration buildings are very well evaluated with the aim to minimize environmental disadvantages and to optimize the benefits.

2.3 Sustainability assessment systems

Besides the regulation in many countries voluntary sustainability assessment schemes are implemented either national or international ones, the most prominent systems are LEED[3], and BREEAM[4]. These have a wider scope of impacts and aspects than LCA or LCA-related aspects required for housing subsidies and building codes: They cover e.g. issues like durability aspects and resources consumed by transport during the production and construction phases. Additionally they comprise criteria from economic and social performance categories.

In specific the HQE ("high environmental quality")-label of France, the DGNB-Gütesiegel of Germany, the "klima:aktiv Haus" standard in Austria are the most frequently employed assessment schemes of the countries under study. In general these assessment schemes seem to be more attractive for clients on one hand enabling clearer decision support towards sustainable construction and on the other hand offering marketable communication of environmental results. However, sustainability assessment systems, also have no strong market penetration.

2.4 Communication and information flow

LCA related subjects during building design and construction are e.g. energy consumption, durability of structure and materials, disassembly, construction related transport, etc. The design team has to exchange information and hand over information and documentation to the client. Communication and documentation on these topics is currently dispersed to various legislative matters, in heterogenous formats or documents. Different formats are generated by different building experts (architects, civil engineers, etc.) for different purposes (submission planning, energy and LCA calculations for subsidies, etc.). There is no consensus on a consolidation of this situation. Currently every member of the design team (architect, civil engineer, energy expert, ecological experts) is responsible for "his"/"her" data. This makes it difficult to put together all generated LCA data to a building's LCA.

One of the core problems of communication and documentation on LCA subjects is the fact, that in the first design phases of a building (preliminary design until building permit) there are no sufficiently easy and necessarily imprecise LCA instruments and tools at hand giving nonetheless significant information and guidance to the designer. So a lot of LCA studies are done after the early planning phases, leaving less opportunity to ecological optimization. In general in Europe most LCAs are done for building already constructed, e.g. LCAs within the scope of a certification.

2.5 Methods and Tools

Most common LCA tools of the investigated countries were ECOSOFT (Austria), ELODIE and EQUER (France), GABI and LEGEP (Germany), GABI and SimaPro (Spain), Environmental Load profile ELP (Sweden). Besides this LCA Tools alternative

[3] Leadership in Energy and Environmental Design, US Green Building Council
[4] BRE's Environmental Assessment Method, UK Building Research Establishment Ltd

tools with LCA-aspects integrated (like energy simulation tools, tools for the calculation of energy certificates) are used.

2.6 Barriers for a broader uptake of LCA

One of the main problems is the high complexity of energy and material flows in all life cycle stages of a building, which causes enormous efforts (time) to handle LCA. Wherever there are attempts, e.g. from public administration, to implement LCA and LCC aspects in procurement policies, etc. they are facing several problems for the practical implementation. On one hand national data bases are still missing and the quality of information of these data bases is perceived as still not sufficient. LCA tools are known to a small LCA community only, thus are not viewed as practicable and commonly accepted by many stakeholders in the construction sector.

3 Suggestions to foster a broader uptake of LCA in practice

The integration of LCA issues in future revisions of the Energy performance of buildings directive (EPBD) would greatly spur the importance of LCA reasoning. The aim should be the inclusion of LCA in the energy certification procedures. Of great importance it is also to develop LCA simplified guidelines or simplified tools to facilitate the stakeholders' use of LCA in buildings. Extensions of existing inventory databases for building processes and materials should be contextualized to specific aspects of the building industry in each country. Awareness campaigns for building users have to highlight the importance of the life cycle of a building. In specific, dissemination among municipalities and owners of large building stock (e.g. social housing, public buildings…), promoting the integration of environmental targets in building programmes could be promising actions. Specialized training activities for the stakeholders about the application of LCA in buildings could further draw attention to the topic and lead to an increase in demand. Subsidy systems should also be informed and enabled to consider giving credits for the use of LCA.

References

[1] LoRe - Low Resource consumption buildings and construction by use of LCA in design and decision making, project within the EU-FP 7

[2] ENSLIC_Build – Energy Saving in Buildings through Promotion of Life Cycle Assessment, project within the Intelligent Energy - Europe programme