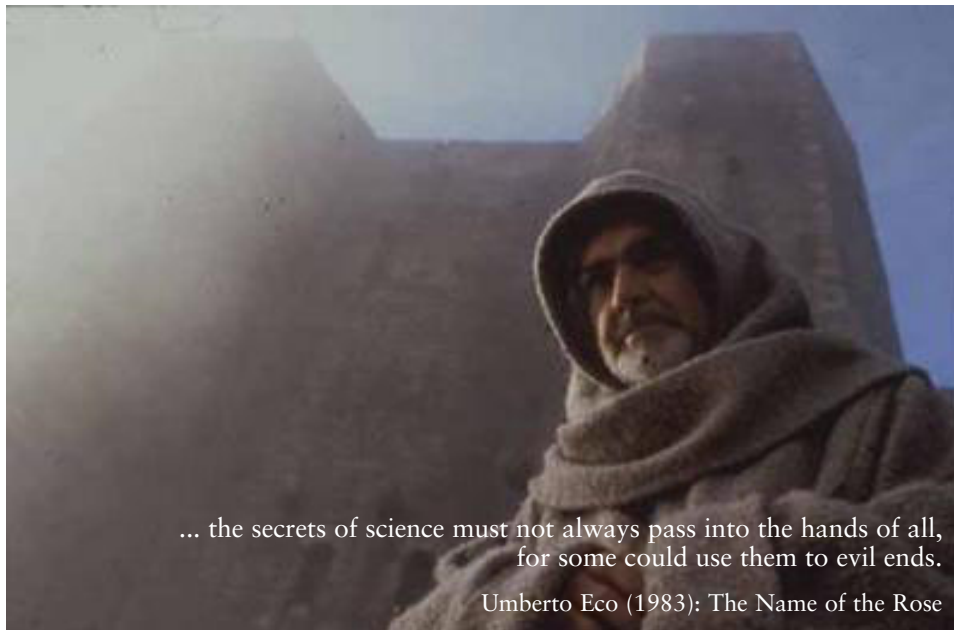


Editorial

Transparency in LCA – a heretical request?

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"But why don't those who possess this learning communicate it to all the people of God?" Nicholas of Morimond asked. And William of Baskerville answered: "Because not all the people of God are ready to accept so many secrets, ...". (Eco 1983, p. 87)

In Umberto Eco's fiction "The name of the rose" (Eco 1983), the monks in an Italian abbey of the fourteenth century tried to get access to certain books in its library. However, these books, among others Aristotle's 'Poetics' which is about laughter, were classified and only accessible for the librarian, Malachias of Hildesheim. He is the guardian of the unimpeachability of the library. Malachias, his predecessor Jorge of Burgos and the abbot himself try to isolate (part of) the knowledge and the learning stored in the library and under their control. Adson of Melk thinks about their reasoning (Eco 1983, pp. 184–185):

Because if this new learning they [the monks] wanted to produce were to circulate outside of those walls, then nothing would distinguish that sacred place any longer from a cathedral school or a city university. Remaining isolated, on the other hand, it maintained its prestige and its strength intact, it was not corrupted by disputation, by the quodlibetal conceit that would subject every mystery and every greatness to the scrutiny of the *sic et non*.

In the latter half of the seventeenth century, during the birth of modern science, it was still common to keep research work secret, although the motivation was a different one (NAS et al. 1995, p. 9):

At that time, many scientists sought to keep their work secret so that others could not claim it as their own. Prominent figures of the time, including Isaac Newton, were loathe to convey news of their discoveries for fear that someone else would claim priority – a fear that was frequently realised.

However, publication practice changed dramatically within the last centuries. Today, publication is part of the research culture adopted by highly reputed universities. The Swiss Federal Institute of Technology Zürich (ETHZ), for instance, pays respect to the research culture based – among others – on unrestricted access to scientific knowledge, while respecting the legitimate interests of individuals or groups.

With this intention, ETH Zürich is in line with the content of the internationally recognised code of conduct in science, "On Being a Scientist; Responsible Conduct in Research" published by the Committee on Science, Engineering and Public Policy in 1995 (NAS et al. 1995). It states that

After publication, scientists expect that data and other research materials will be shared with qualified colleagues upon request. [...]. Sometimes these materials are too voluminous, unwieldy, or costly to share freely and quickly. But in those fields in which sharing is possible, a scientist who is unwilling to share research materials with qualified colleagues runs the risk of not being trusted or respected.

It seems as if publication and openness, sharing results and thoughts are acknowledged qualities of today's scientific

research. In (NAS et al. 1995), they are accompanied by further codes of conducts on the allocation of credit (in the list of authors, in the acknowledgements of contributions from others and in the list of references or citations) and on authorship practices. All together, the three measures, publication and openness, allocation of credit and authorship practices, are intended as a solution to the problem of making new learning and knowledge public while assuring their author's credit.

Let us now turn to life cycle assessment and review statements on publication and transparency in that particular field. The international standards on life cycle assessment are mainly in line with a research culture of publication and openness as described above. They include unequivocal and clear statements on the reporting requirements. In clause 6 of the standard on principles and framework (International Organization for Standardization – ISO 1997), the following general statement is made:

The results, data, methods, assumptions and limitations shall be transparent and presented in sufficient detail to allow the reader to comprehend the complexities and trade-offs inherent in the LCA study.

The standard on goal and scope definition and inventory analysis (International Organization for Standardization – ISO 1998) is more concrete and surprisingly clear. It states in clause 8 that a third party report shall include – among many other things – the following items:

- c) Inventory analysis
 - 1) ...
 - 2) qualitative and quantitative description of unit processes
 - 3) source of published literature
 - 4) calculation procedures
 - 5) ...

Hence, the ISO standards are quite demanding in terms of transparency and the possibility to duplicate the results (hereby, duplication should not be confounded with plagiarism). So far, the regulatory basis for LCA reporting to third parties is rather clear. However, reality is seldom that simple and evident. Confidentiality of information and data is named in the first place by industry associations and individual companies when it comes to barriers to data collection and publication (de Beaufort-Langeveld et al. 2003, p. 4). Furthermore, industry fears that LCA data can be misused by competitors and other interests, including government (de Beaufort-Langeveld et al. 2003, p. 8). These concerns need full acknowledgement and adequate treatment.

In the recent past, two more arguments have been brought forward, one of which is derived from the confidentiality argument mentioned above. In a recent key note speech held at the first international eco-efficiency conference, Leiden, the Netherlands, it was claimed that transparency in LCA data leads to reduced data quality and reduced usability. In particular, the following statements were made (Eyerer et al. 2004, slide 11):

more transparent data = lower quality data: Transparency prevents from having actual, detailed and complete unit process data on yield, by-products, emissions, etc. (Confidentiality needed!)

more transparent data = less efficiently usable data: Transparency makes databases more complex and difficult to use and shifts the responsibility of quality control to the user. (Responsibility should remain at data provider!)

Does this mean that transparent reporting to third parties as required by the ISO standards 14040 and 14041 diminishes the quality of LCA? Can we trust in LCA results and in conclusions drawn on LCA studies based on fully transparent data? Let us examine the two allegations one after the other.

More transparency = less quality: This allegation calls for a differentiated discussion and should also profit from LCA experience gained in the past. The following differentiation is proposed: In every product system we encounter processes that are not specific for that product system and that occur in almost all product systems. Among these, energy supply, construction and manufacturing material supply, transport services (provided by lorries, railways, ships and airplanes), and waste treatment services – until now – are the most prominent ones. They may be called 'the commons' of an LCI product system (others may call it 'background system'). On the other hand, there are some to many unit processes in a product system that are specific for one particular functional unit, be it the inputs and outputs for manufacturing a stainless steel heat exchanger, a bedside table lamp or diapers.

In many instances the 'commons' are well documented and information is publicly available. The production shares of a nation's electricity mix are published. Information on net efficiencies and emission factors (averaged per fuel type) of main air- and waterborne pollutants (such as NO_x, SO₂, particulates, Carbon-14, Krypton-85) of power plants are publicly available too. Reference works on average fuel consumption and emission factors of today's (and past) vehicle fleets (distinguished by vehicle categories) are publicly available as well. In most European countries, waste treatment is a task of public authorities. The energetic and environmental performance of current waste treatment technologies such as waste incineration is extensively monitored and the information is publicly available. The construction and manufacturing materials' sector is the most diversified one and no general statement on the availability of data can be made. However, large plants are obliged to report some environmental key figures to the authorities and averaged emission factors are available as well. Furthermore, some industries and industrial associations are willing to communicate their environmental performance in their annual environmental reports or in detailed and sufficiently transparent LCI reports (see, for example, EAA 2000). Hence confidentiality contributes only little, if anything at all, to an increase in data quality of most of the 'commons' datasets.

There is no incentive for LCA commissioners to allocate a certain share of an LCA-budget to the maintenance of the commons, of the frequently used, and sometimes even result-determining generic LCI datasets. Unfortunately, even LCI is not invulnerable to the natural law of the 'tragedy of the commons' firstly introduced by Hardin (1968). Because of the lack of particular interest in 'commons' data, public authorities or governments are potential commissioners, while industries are most valuable partners of LCI data research in that field.

However, for data of very specific, company-owned processes, goods and services that are to be integrated in an LCA intended for publication, concerns on knowhow drain, and

information misuse need to be respected. Many possibilities have been identified and used in practice to find a sensible solution to that problem. These range from showing the data but anonymising the data source, aggregating data horizontally (averaging 'gate to gate' data of production sites), partially aggregating vertically (clustering certain unit processes to hide sensible data), to finally fully aggregating unit processes to product systems (that means change from 'gate to gate' data to cumulative LCI results). Especially the last option, however, should be used as a last resort only. And considering the above, they won't be numerous in generic databases, where most of the datasets are 'commons'. Let us now turn to the second allegation on reduced usability.

More transparency = less convenience: An LCI database that offers fully transparent information is not restricted to show only unit process raw data. Cumulative LCI data ('cradle to gate' or 'cradle to grave') may be offered additionally in order to facilitate data use in daily LCA work. The main responsibility for quality control remains with the data provider irrespective of the aggregation level of the LCI data. But providing fully transparent LCI data allows for an independent review by the interested LCA practitioner, for an individual evaluation of the origin of environmentally important elementary flows or processes, and – very important in terms of quality control – an independent assessment of the appropriateness of a certain dataset for a particular LCA case study. Furthermore, unit process raw data may be adapted to particular needs, something which is impossible without the help of the person delivering the data when only cumulative LCI results are available.

Hence, the publication of unit process raw data and cumulative LCI results helps to increase the data quality in LCA case studies and to sharpen the eyes of LCA practitioners towards effective and case-specific LCI data judgement.

One other aspect calls for a clarification: Of course, fully transparent LCI data is not a synonym for high quality data. But, unlike cumulative LCI results, the quality level of unit process raw data can be verified rather easily and without much additional effort and information. However, how does one address data quality assessment on cumulative LCI results that comes along with a process documentation of unverifiable quality?

The two arguments against a higher level of transparency cited and discussed above do not hold a thorough analysis. On the one hand, fully transparent data do not imply lower or higher data quality, but *known* data quality. It certainly does not imply lower quality of LCI datasets on the 'commons' as defined above. On the other hand, more transparency indeed means more (and not less) convenience for the LCA practitioner.

I would like to conclude summarising incentives and challenges of reporting fully transparent LCI data. Fully transparent reporting to third parties

- is in line with international research culture;
- complies with and fulfils the international standards on LCA;
- increases the credibility of and trust in LCI data;

- allows competition by means of full comparability;
- is more convenient as the user can choose between (adaptable) gate to gate LCI data and (fixed) cumulative LCI results, depending on his / her needs;
- makes customers more independent on knowledge owners (LCA consultants, research institutes at universities);
- makes LCA case studies cheaper and provides opportunities to SME's to offer high quality consulting at moderate costs;
- works even better if industry is willing to co-operate;
- empowers LCA competitors (in research and consulting);
- challenges the ethical responsibility of LCA practitioners, consultants and researchers to accurately acknowledge the work done by others;
- is endangered by free riders that only absorb information, but do not provide knowledge and learning in a similarly open way.

Experiences made with fully transparent reporting at the turn of the millennium are promising. We seem to have overcome the époque documented in Umberto Eco's "The Name of the Rose" when knowledge and learning was kept secret and only a few dedicated had access to it. More challenging are the free rider problem and the (perceived?) risk of knowledge drain. Finally, data collection and update of the LCI 'commons' needs continuous financing. While a mutual agreement on an LCA code of conduct may help to overcome the former challenge, a joint venture on LCI data collection and (partial) public funding might be a solution to the latter.

I would like to invite representatives from academy, industry and consulting to give their opinion on the (heretical or necessary) request on transparency in LCA reporting.

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