

## Working Paper No. 7

### Notes Regarding Transparency, Data Publishing (Unit Processes) and Data Exchange

#### ISO Guidance Regarding LCA Transparency

ISO 14040, the standard that sets out general LCA principles and a framework, defines transparency as “open, comprehensive and understandable presentation of information”. The standard then expands on this basic definition as follows:

“The scope, assumptions, description of data quality, methodologies and output of LCA studies should be transparent. LCA studies should discuss and document the data sources, and be clearly and appropriately communicated” (p. 3); and

“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” (p. 8).

These requirements are especially important when LCA results are to be communicated to third parties (i.e., other than the commissioner of the study and the LCA practitioner). Indeed, **reporting requirements are the means by which ISO puts an operational overlay on the transparency criterion.** 14040 sets out, in broad terms, what shall be covered in third-party reports (pp. 8-9).

ISO 14041, which deals in more detail with LCA goal and scope definition and inventory analysis, sets out specific reporting requirements. Here, documentation requirements are tied to the goal and scope definition for any specific study. If (as is clearly true in our case), results of the LCA will be communicated to any interested party other than the commissioner or the practitioner of the study, then a third party report must be prepared (ISO 14040, section 6).

The following is an attempt to briefly summarize 14041’s language on key issues relating directly to transparency:

- Section 5.3.3 on initial system boundaries states that “the system *should* be described in sufficient detail and clarity to allow another practitioner to duplicate the inventory analysis.”
- Section 5.3.5, on criteria for initial inclusion of inputs and outputs: “The criteria and the assumptions on which they are established *shall* be clearly described. The potential effect of the criteria selected on the outcome of the study *shall* also be assessed and described in the final report.” And, “Where the study is intended to support a comparative assertion made to the public, the final sensitivity analysis of the inputs and outputs data *shall* include the mass, energy and environmental relevance criteria.”
- Section 6.3, on data collection: “A description of each unit process *shall* be recorded. This involves the quantitative and qualitative description of the inputs and outputs needed to determine where the process starts and ends, and the function of the unit process. Where the unit process has multiple inputs... or

multiple outputs, data relevant for allocation procedures *shall* be documented and recorded.”

- Section 6.4.5, on refining the system boundaries with sensitivity analysis to test significance: “The results of this refining process and the sensitivity analysis *shall* be documented.”
- Section 6.5.2, on allocation principles: “The allocation procedure used for each unit process of which the inputs and outputs are allocated *shall* be documented and justified.”

Finally, Section 8 of ISO 14041 provides a summary list and differentiation of those aspects of a study which *shall* be documented in the third party report, versus those which *should* be considered for inclusion. One might be surprised that many important aspects of initial system boundary selection are not required for reporting; this is evidently because the standard calls for an iterative, sensitivity analysis-based refinement of system boundaries, and it calls for reporting of the results of this sensitivity analysis. Also, documentation of limitations of the LCI is a “should” rather than a “shall”.

### **Usage-based Definition of LCA Transparency**

Starting from and building upon this guidance from ISO, we suggest developing transparency guidelines for the US LCI project which stem additionally from a user-centered definition of transparency. As a starting suggestion, transparency means providing enough information about either an LCA process description, an LCA system model, or an LCA study so that others can —

- appreciate its strengths and weaknesses;
- know where data came from;
- know how well the data represents an industry or process;
- understand how calculations were made;
- validate the results through testing and cross-checking of data and modeling; and, ultimately,
- determine for themselves the extent to which they can rely on and use the resulting data

### **Achieving Transparency in the US LCI database**

How can we achieve transparency as defined above for the US LCI database? The solution, it would seem, lies in providing an adequately documented database of unit processes. First, the US LCI database project must determine what this *adequate documentation* consists of, using the ISO guidelines as a set of minimum requirements. We offer the following elements as additional starting points:

1. All primary data should be identified as to age, source, method of collection (e.g., measured, estimated from process engineering, etc.) and with adequate description of the technology.

2. Primary sources should be identified in terms of how representative they are of an industry or process group (e.g., not just 4 plants out of 20 surveyed, but also the percentage of total production represented by the 4 plants).
3. All secondary data should be cited to specific sources with complete reference information (e.g., table and page numbers).
4. The methods used to protect proprietary information (e.g., use of weighted averages, data for one product rolled in with that of a similar product, etc.) should be clearly described.
5. All assumptions and calculation methods explained in sufficient detail that a reader or reviewer can duplicate basic calculations

Further on documentation, we suggest that the project review and strongly consider adopting the documentation format which has been worked out through years of deliberation and synthesis of prior projects (notably SPOLD and SPINE) and which is now embodied in the draft ISO 14048 standard for LCI data documentation.

A final aspect of transparency should be noted, which is in fact the key starting point for achieving it in this project. That is the open publication of a research protocol governing how the databases are to be developed. Such a protocol must be detailed and explicit, should be critically reviewed in its own right and then be useful as a benchmark for critical review of completed studies.

### **Data Publishing (Unit Processes)**

We need to consider the issue of publishing unit process data, rather than simply the rolled-up cradle-to-gate results for a selected set of basic material products. ISO 14040 (1997) defines a unit process as “the smallest portion of a product system for which data are collected when performing a life cycle assessment.” We suggest that for many reasons, including transparency, the US LCI database should present its data on a fully disaggregated unit process basis, consistent with the protection of any proprietary information, with roll-up procedures clearly explained (as indicated in number 4 above).

Publishing a database at the unit process level adds considerable value to the database development effort, bringing a number of very significant advantages to all users and even to providers of the data:

- a) It enables world-wide continuous zero-cost critical review, reaching a far wider – and ultimately more capable – audience of experts than otherwise possible, who have access to data that can confirm or improve the database;
- b) It yields a higher value database, since the parts (individual processes or groups of processes) can be used in other studies;
- c) It enables easier and lower-cost updating;
- d) Making the process “tree” available to users rather than simply rolled-up cradle-to-gate totals provides an ability for users to use regionalized life cycle impact assessment methods where important and available;

- e) Process tree information (versus rolled-up cradle-to-gate totals) is also a prerequisite to meaningful uncertainty analysis, since uncertainty arises largely by the application-specific use of data describing a particular process or product system to model a somewhat different process or product system, and the resulting uncertainty is related to the degrees of difference between the subjects of the original process data and the processes which they are being used to model
- f) Most of all, a properly published and documented unit process database achieves what LCA must achieve if it is to be taken seriously: repeatability of results, and user ability to test the potential influence of altered assumptions such as different allocation rules, different common process data, and different boundary truncation rules.

Publishing data on individual unit processes is thus extremely valuable.<sup>1</sup> Still, the US LCI project may wish to consider going a bit further. This is because users ultimately seek final cradle-to-gate total inventories for products. To create a final cradle-to-gate inventory requires unit process data *and* decisions on allocation of inputs and releases among any process co-products.

The simplest way to publish decisions on allocation in a unit process format is to create and publish individual processes for each product and co-product, (whose burdens per unit output will thus be proportional to each other) together with adequate documentation of the allocation decision and its basis.

A more powerful solution worth investigating would be to publish the database on an interactive website, for example, in a way that provides users with an ability to select decisions on allocation rules and receive a computed cradle-to-gate result report based on the selected assumptions. This would be essential to fully achieve transparency aspect (5) and transparency objective (f) above: repeatability and verifiability of LCA results.

### **Software exchange and data formatting**

It is an objective of the project to publish the data in a way that maximizes its usability. A major route for such usage is existing LCA software tools. The SPOLD data exchange format was developed and published to facilitate data exchange among such software tools. A SETAC working group recently tested prominent software tools' ability to exchange data using this format, and found them lacking.

By publishing unit process details and by documenting the data according to the ISO 14048 documentation format, this project will go a long way towards making the data usable by a variety of software tools at relatively low cost to the tool providers. The project's Transparency and Publishing task group should investigate whether there are additional low-cost, high-payoff steps which could be taken to further promote widespread data usability.

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<sup>1</sup> For reasons such as those cited above, it is being selected as the preferred method for data publishing by such new and leading LCI database projects as the European "EcoInvent 2000."