# Life-Cycle Assessment Practitioner Survey

## Summary of Results

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Over the past several years, significant progress has been made in building life-cycle assessment (LCA) capacity throughout the world. To gain a better understanding of the current activities of LCA practitioners, a Web-based survey was initiated early in 2005. Although not intended to be statistically valid, the survey was intended to investigate how LCA is being conducted, how results are being used, what benefits have been realized from the use of LCA, and what barriers exist for increased application of LCA. We report on and assess the results of this informal survey in this and the forthcoming columns. The survey results are available at <http://faculty.washington.edu/cooperjs/Research/lca_survey.htm>. This survey is a follow-up to a previous survey on the teaching of LCA in North America in 1999 (Cooper and Fava 1999, 2000).

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Sixty-five LCA practitioners participated in the survey, with 66% from North America, 23% from Europe, and the remainder from Brazil, China, India, Japan, and Mexico. The largest group of respondents categorized their organizations as materials production and manufacturing/construction (47%), followed by academia (20%), consulting and government (both at 11%), and nongovernmental organizations (6%). Within these organizations, respondents function as researchers (20%), are involved in college or university education and research (15%), are business managers or product and process designers/ product stewards (both at 14%), are involved in environmental health and safety (12%), and are at between 3 and 5% in marketing and sales, professional education, primary and secondary (K-12) education, and public policy. These practitioners use LCA results in business strategy (by 63% of respondents), in research and development (62%), as input into product or process design (52%), in education (46%), in policy development (43%), in labeling/product declarations (37%), in sales (26%), in procurement (20%), and for other uses (8%). The latter includes invitation to tender.

### How LCA Is Being Conducted

Survey questions concerning how LCA is being conducted focused on the type of LCA used (streamlined, based on national input-output matrices, or based on process chains), data sources for inventory analysis and impact assessment, LCA tools, and peer review practices. Within the context of the type of LCA used, 77% of respondents have developed LCAs following ISO 14040 standards (ISO 1997) and 69% using streamlined LCA (Todd and Curran 1999) or economic input-output methods (Hendrickson et al. 1998). Fully 54% of respondents note the use of both, leaving 15% of respondents never using ISO LCA and 23% of respondents never using streamlined LCA or economic input-output methods.

Inventory data collection was cited as the most *time-consuming* and *costly* part of LCA by



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68% and 63% of respondents, respectively. Data are collected from industry by 75% of respondents, from databases developed for LCA costing more than U.S. $10,000 by 23% of respondents, from inventory databases developed for LCA costing less than U.S. $10,000 by 52% of respondents, from literature or databases not developed for LCA by 58% of respondents, and using models based on science and engineering principles by 43% of respondents. Interestingly, of those citing inventory data collection as the most time-consuming or costly part of LCA, 86% use data sources other than those developed for LCA for the majority of their data.

Analysis and interpretation of inventory data and impacts were only cited as the most time-consuming part of LCA by 15% of respondents and the most costly by 20% of respondents. This response was underscored by the widespread use of off-the-shelf LCA software, used by 69% of the LCA practitioners responding to the survey. Of these, 58% use GaBi, 31% use SimaPro, 13% use TEAM, and the remainder use BEES, the Boustead Model, ECO-IT, KCL, LCAdvantage, Life 365 and Stadium, and Umberto.[1] Spreadsheet programs are used by 46% of respondents, with mathematical packages such as Matlab, Mathematica, or Maple and models developed by the respondents and others in programs such as C, Java, or Fortran also used to a lesser extent.

For impact assessment, the EcoIndicator methods were the most frequently cited as used by respondents, followed closely by the use of CML, TRACI, and self-assembled sets of impact indicators (Jolliet et al. 2004). In fact, a number of practitioners noted the use of multiple methods, seeking a comparison of results based on both impact midpoint and endpoints. Others noted ongoing research efforts to compare impact assessment methods and described active discussions and disagreement among practitioners related to the possibility of standardizing impact assessment or developing "global defaults."

Although all respondents have used some type of peer review, 45% noted that they had conducted or contributed to LCAs with no peer review. This latter group primarily represented those involved in research and product and process design. For all respondents, 38% have used internal company peer review, 33% have used an external review by a single person, and only 28% have used an external panel review. Concerning peer review, 57% of respondents stated that the majority of their peer reviews were completed at the end of the LCA project, 6% stated that the majority of reviews were at the beginning and end of the project, and 25% stated that the majority of reviews were interactive throughout the project.

Four respondents mentioned peer review issues within the context of cost and impact assessment. Specifically, one respondent noted that the LCA practitioner survey might have included peer review in the assessment of the costly aspects of LCA. Also, peer review was mentioned by two practitioners as the means by which an impact assessment method was chosen. Finally, impact assessment standardization was suggested as a means to streamline peer review.

## Benefits and Barriers

Practitioners saw LCA as a good tool to examine the environmental impacts of products, a quantitative way to estimate the life cycle resources and burdens, and a way to quantify alternatives in product systems. They also believed that LCA imparted value by providing additional information to internal product design and development teams, as well as providing environmental information to customers; apparently this customer interaction appeared to be more related to business-to-business than consumer interest.

When asked why LCA is not applied to more products and processes, several reasons were repeatedly stated:

1. Time and resources requirements for the collection of data
2. Complexity of the LCA method
3. Lack of clarity as to the relative benefits compared to the costs of conducting the LCA studies, including lack of apparent downstream interest or demand

Although difficulty with performing impact assessment exists, the overwhelming concerns were the time and resource demand for inventory data to be used and the complexity of the LCA method (although a few responders, who appeared to be more experienced practitioners, implied that the

complexity was more related to first-time or new practitioners.)

## Conclusions and Recommendations

This informal survey appears to indicate that today's LCA practitioners rely heavily on the growing LCA computing infrastructure. We draw this conclusion based on three things: (1) the dominant use of off-the-shelf software, (2) the identification of inventory data collection as the most time-consuming and costly part of LCA when dedicated LCA data sources do not dominate, and (3) method complexity as a barrier to further application of LCA. All three points emphasize the need for methodological transparency related to inventory and impact data sources as well as in LCA and sector-specific analysis tools if LCA is to move further into public and private decision making.

A number of suggestions were provided to overcome some of the obstacles or barriers to LCA use. These included greater development of and funding for life-cycle inventories (LCI) databases (including the U.S. LCI database effort and a standard approach/template for data collection), availability of an internal champion for the promotion of LCA within an organization, development and dissemination of the value that LCA provides (one responder mentioned the development of the business case for LCA), and anything that can be done to simplify the conduct of an LCA and reduce the costs and time required to complete the study. One particular suggestion was to overcome the competitive spirit among the LCA tool developers/providers. Apparently if greater understanding of the LCA tool options and the characteristics of each is encouraged, an increased acceptance and use of LCA might result.

We will provide further analysis of survey results in coming columns, including a discussion of the pros and cons of standardization efforts (including sector-specific standardization), which go beyond the existing ISO 14040 family of LCA standards; ideas on building further awareness and capacity into the practice of LCA; and recommendations for construction of a statistically valid survey of practitioners.

## Note

1. A listing of LCA and related software can be found at LCAccess, the U.S. Environmental Protection Agency's Web site on life-cycle assessment <www.epa.gov/ORD/NRMRL/lcaccess/>.

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