Chapter 5
Life Cycle Assessment as Reflected by the International Journal of Life Cycle Assessment

Almut B. Heinrich

Abstract Six 'milestones' in the life of the journal (until 2013) are identified in this chapter and the accompanying literature is discussed:

1. Institute for Scientific Information (ISI)—impact factor
2. Online publications
3. National societies and other organisations and networks
4. New topics and subject areas
5. Special issues and supplements
6. ISO standardisation of LCA

These 'milestones' have significantly impacted the development of Int J Life Cycle Assess and, thereby, that of the field of LCA.

The sections of this chapter demonstrate that Int J Life Cycle Assess

- has been a truly international journal from the beginning,
- addresses the global LCA community,
- offers a unique spectrum of LCA-related information,
- applies to scientists, practitioners, consultants, governments and administration,
- responds to the growing awareness that life cycle-based assessment methods are unique achieving sustainability,
- the field of LCA and Int J Life Cycle Assess have interacted and mutually benefited.

Keywords CHAINET · Digital object identifier · Impact factor · Institute for Scientific Information (ISI) · Int J Life Cycle Assess · ISO standardisation of LCA · ISOLP · LCA · LCANET · Life cycle assessment · Life cycle assessment in Australia · Life cycle assessment in India · Life cycle assessment in Japan · Life cycle assessment in Korea · Life cycle assessment in New Zealand · Life Cycle Costing (LCC) · Life Cycle Management (LCM) · National societies · Online publications · SETAC · Social Life Cycle Assessment (SLCA) · Special issues · SPOLD · Subject areas · Supplements · Swiss Discussion Forum on Life Cycle Assessment · UNEP/SETAC Life Cycle Initiative

A. B. Heinrich (✉)
Steinhofweg 63, 69123, Heidelberg, Germany
e-mail: abh.scientificjournals@googlemail.com

W. Klöpffer (ed.), *Background and Future Prospects in Life Cycle Assessment,*
LCA Compendium – The Complete World of Life Cycle Assessment,
DOI 10.1007/978-94-017-8697-3_5, © Springer Science+Business Media Dordrecht 2014

1 Introduction

The following two statements from The International Journal of Life Cycle Assessment (Int J Life Cycle Assess) are programmatic:

- "This Journal … is the first to be devoted entirely to the science and practice of LCA. It is conceived as an international scientific journal … " (Klöpffer 1996, editorial).
- " … we offer a unique spectrum of LCA-related information, indispensable for the whole LCA community" (Klöpffer and Heinrich 1999, editorial).

This chapter demonstrates the trueness of these statements.

"Hitherto, publication in the field of LCA has been restricted to Workshop Reports, the LCA-Newsletters, and much 'gray literature'. Very recently, Environmental Toxicology & Chemistry, published by SETAC, provided access to LCA-type articles. Several journals specialised in environmental sciences, packaging, surfactants, etc. sporadically publish papers related to LCA" (Klöpffer 1996, editorial).

With the launch of Int J Life Cycle Assess in December 1995, publishing in the field of LCA (Life Cycle Assessment) changed completely. The Journal, conceived as an international scientific journal, was the first to be devoted entirely to the science and practice of LCA. It continues to be the only regularly published journal dedicated to LCA.

The establishment of Int J Life Cycle Assess was fully acknowledged and confirmed on the occasion of Walter Klöpffer's birthday in 2008 by members of the Editorial Board (Hunkeler et al. 2008):

> The LifeCycle: Vast amount of aspects—many different interpretations—few global players—one relevant journal! Martin Baitz
>
> Walter and his colleagues had already been active in LCA. Since then Walter has taken a visionary position in striking new ground with the Journal of LCA—at that time few thought it would succeed—not enough interest in this new but growing tool. He was right. His leadership with the journal, willingness to partner with groups to advance LCA globally, breaking ground on the LCA study peer review process, and improving the quality of the LCA papers in the journal have all been some of the success factors that has established LCA as a solid tool in business and governments to improve our product and packaging systems. James Fava
>
> During the early 90's it was quite difficult to get LCA papers published in scientific journals. This hampered the development of LCA and the acceptance of LCA results. Starting The International Journal of LCA was a key step in the development of LCA as a tool. This has been immensely important for development of LCA as a scientific discipline and the acceptance of LCA as a tool. Göran Finnveden
>
> When the LCA community was fully working within the SETAC organisation, Walter came up suddenly with the surprising idea of establishing an international journal on LCA, fully independent from our scientific home. Surely we found this journal a very good idea, there was a real need for it; but why in this way? Would it work? And now we can say, yes, look how good this idea was, precisely in the way he proposed. Helias A. Udo de Haes

The following sections show how the global LCA community is addressed by Int J Life Cycle Assess, both geographically and topically.

Section 2 identifies ‘milestones’ in Int J Life Cycle Assess.

Sections 3 and 4 discuss two ‘external’ elements that opened the way to the global and topical adoption and proliferation of the journal and, therewith, to the field of LCA. These are the impact factor and the digital object identifier; the latter was the pre-requisite for the online editions.

Section 5 describes the national societies and other organisations, networks and initiatives which continue to contribute considerably to the success of the journal.

Section 6 deals with the great variety of new topics and subject areas which mirror the development of LCA in the journal.

Section 7 covers the many special issues and supplements mapping the acceptance of the journal and its geographical and topical coverage.

Section 8 compiles the articles on the ISO standardisation process of LCA in the journal.

2 Milestones in Int J Life Cycle Assess

The following ‘milestones’ in the life of the journal impacted the development of Int J Life Cycle Assess[1], and represent the themes of this chapter.

1. Institute for Scientific Information (ISI)—impact factor
   On September 25, 2001, ISI (Institute for Scientific Information) accepted Int J Life Cycle Assess for coverage in Science Citation Index Expanded, beginning with issue no. 1 of vol. 6, 2001.
   In addition, Int J Life Cycle Assess was included in ISI Web of Science, ISI Alerting Services, and Current Contents/Agriculture, Biology, and Environmental Sciences.
   This was the prerequisite for calculating an Impact Factor.
2. Online publications
   In issue no. 6 of vol. 4, 1999, it was announced that, by means of the DOI (digital object identifier), articles can be published shortly after their acceptance, which means weeks or months before they can appear in the printed journal and even before the issue number and the true page numbers have been determined.
3. National societies and other organisations and networks
   The national societies as well as a number of other organisations and networks reflect the proliferation of the journal and simultaneously the global adoption of the field of LCA.

By 2000, Int J Life Cycle Assess was the Official Organ of four societies: JLCA (LCA Society of Japan), ISLCA (Indian Society for LCA), KSLCA (Korean Society

[1] The journal was founded and published, from 1996 to 2007, by ecomed publishers, Landsberg/Lech, Bavaria (Germany). Then the abbreviation of the journal was ‘Int. J. LCA’. When the journal was transferred to Springer-Verlag in 2008 (Roos 2007), the abbreviation changed to ‘Int J Life Cycle Assess’.

for LCA), and ALCAS (Australian LCA Society). LCANZ (Life Cycle Association of New Zealand) joined in 2005/2010. Of these four societies, JLCA has been the most active.

In 2003, Int J Life Cycle Assess became the 'Associated Journal of UNEP/SETAC Life Cycle Initiative'.

4. Topics and subject areas
5. Special issues and supplements
6. ISO standardisation of LCA

3 Institute for Scientific Information (ISI)—Impact Factor

Since 2001, Int J Life Cycle Assess has been listed in the Science Citation Index (the Science Citation Index Expanded, to be exact).

There are two striking papers on the 'philosophy' of the impact factor as it relates to Int J Life Cycle Assess:

1. 'Int J LCA Could Have Received Better Acknowledgement' by Henrikke Baumann (Baumann 2002)
2. 'Publishing Scientific Articles with Special Reference to LCA and Related Topics' by Walter Klöpffer (Klöpffer 2007, p. 73)

Henrikke Baumann criticised that ISI did not allocate the journal to the Science Citation Index but rather to the Science Citation Index Expanded. She argued: "Inclusion in the SCIExp [Science Citation Index Expanded] is a good acknowledgement, but inclusion in the SCI (Science Citation Index) is better. The Institute for Scientific Information (ISI) covers 8,000 journals annually to produce the SCI, the SCIExp [now SciSearch] and other related information products (ISI 2001). The SCIExp covers approx. 5,800 leading scientific and technical journals, while the SCI includes only 3,800 journals which are considered to be the most influential, i.e. the SCI is a subset of the SCIExp. The point is, Int J LCA could have done better. It could have been included in the SCI, if only ISI had got access to more profound citation statistics" (Baumann 2002).

Admittedly, the people at ISI had to first review the journal in terms of its regular appearance, the appropriate frequency, as well as the scientific approach, contents and setting. However, it took them five years (1996–2000) to accept the journal for coverage. The reason may be that, being the first environmental life cycle assessment journal (Klöpffer 2007), Int J Life Cycle Assess did not belong to the 'classical' scientific categories within ISI. Therefore, it may have been eyed with scepticism. This may also be the reason for the deviation via the Science Citation Index Expanded. This deviation has not yet been changed, although the 'access to more profound citation statistics' should have been given in the meantime.

An actual overview of all Abstracting and Indexing services covering Int J Life Cycle Assess can be found at:

http://www.springer.com/environment/journal/11367

4 Online Publications

The ecomed publishers introduced the DOI in 1998. With this, the suffix could be created which reflected the journal, the year of publication, the month of publication and the running number. It followed a very creative phase of building the directories of the online editions, jointly with the most capable and visionary webmaster Rainer Schwandt.

"With Online-First, articles can be published shortly after their acceptance by reviewers, authors, and editor, which means weeks or months before they can appear in [the printed] Int. J. LCA and even before the issue number and the true page numbers have been determined. … Publication date of the article is the Online-Publication Date which is indicated in both Online-First and the printed article in Int. J. LCA.

Online-First is not a pre-print service—the publications are in their final form; they can be neither changed nor withdrawn. However, an Erratum can be added. For the publication in [the printed] Int J Life Cycle Assess, only the final page numbers, the citation line, and the online publication date will be added.

Citation of Online-First articles: They can be cited by the Digital Object Identifier (DOI) which is an identification code and included in both the print and the electronic versions. The corresponding URL is listed in the abstracts of Online-First articles. Once a DOI is assigned to an article, it accompanies the paper until its final fate and should therefore be part of the citation line of this article. The DOI secures the identification of online articles wherever they are stored.

… The Online-First directory hosts the accepted articles before they are printed. Then they are shifted into the data bank [the directory of the online editions] where they can be identified by … the DOI" (Heinrich and Klöpffer 1999).

In November 1999, the first five OnlineFirst papers were published, only one year after the introduction of the DOI by ecomed.

Despite the growing interest in moving towards online publishing, much attention continued to be paid to the printed edition, above all to the cover pictures. From issue to issue it was a great pleasure to create the cover pictures together with Edwin Grondinger (abavo, Buchloe, Bavaria, Germany), an exceptionally skilled designer. The cover pictures always referred to one or several papers of the individual issues. Grondinger was briefed on the underlying idea by the Managing Editor, but additionally contributed his own vision and imagination, and the final product convinced authors and readers.

Figure 5.1 shows a beautiful example, namely the 'Schlossberg' at Graz, Austria (issue no. 4, vol. 2, 1999). This cover picture refers to a conference report on the

Fig. 5.1 Cover picture of vol. 2, no. 4, 1999

Society of Automotive Engineers (SAE), 'LCA on the Third SAE Conference on Total Life Cycle in Graz, Styria, Austria'.

Authors of specific articles were at times invited to suggest cover pictures. One of the most impressive results was the cover of the special issue no. 1, vol. 10, 2005, on the occasion of the five-year existence of the ecoinvent database (see Sect. 7). Rolf Frischknecht, the Special Issue Editor and the ecoinvent project manager, provided the fascinating idea for this cover picture (Fig. 5.2).

In 2008, the journal was transferred to Springer-Verlag (Fig. 5.3).

Fig. 5.2 Cover picture of vol. 10, no. 1, 2005

5 The National Societies

5.1 LCA Society of Japan

LCA was formally recognised in Japan with the creation of the industry sponsored Japan LCA Forum in 1991. In 1995, the LCA Society of Japan (JLCA) was established and funded by MITI (Ministry of International Trade and Industry). The society included over 400 members from material, energy, construction and distribution companies, as well as from the educational and public sectors. JLCA published a quarterly newsletter 'Forum News' in Japanese.

Fig. 5.3 Cover picture of vol. 6, no. 7, 2007, announcing the transfer to Springer

The Corner of the LCA Society of Japan (JLCA) in Int J Life Cycle Assess was established in vol. 2, no. 2, 1997; giving regular coverage of JLCA activities. In turn, JLCA previewed and profiled the journal in ECP Network News from Japan (ECP—Environmentally Conscious Products). ECP, the Environmental Network Newsletter, was sponsored by JEMAI, Japan (JEMAI—Japan Environmental Management Association for Industry).

The cooperation between Int J Life Cycle Assess and JLCA was a symbiotic relationship, or in modern speak, a win-win situation which proved to be fruitful. Other societies soon followed.

The JLCA was divided into three groups:

- examination of LCA methods
- examination of database construction
- application of LCA

The Society had two main objectives:

- the exchange of information and
- the establishment and use of common LCA data.

In 1998, the National LCA Project, namely the development of a database, started. It was planned by JLCA and financially supported by MITI. The five-year project consisted of members from industry, university and research institutes. The main subject areas were: Development of an Inventory Data Base; LCA Case Studies; LCA Application Guidelines; LCA Education and Propagation; Inventory Analysis Methodology; Impact Assessment Methodology (Morimoto 1997).

This National LCA Project was covered in several papers in Int J Life Cycle Assess:

- The Progress of the Impact Assessment Study Committee in the National LCA Project of Japan (Itsubo 1999a)
- The Progress of Inventory Study Committee WG2 in the National LCA Project in Japan (Itsubo 1999b)
- The Progress of the Database Study Committee in the National LCA Project of Japan (Nakahara 1999)
- Launch of the Damage Function Sub-Committee in the National LCA Project of Japan (Itsubo 2000)
- Current Activities of the National LCA Project in Japan (Yano et al. 2000)

In the following two years, research focused on various case studies and procedures of interpretation.

As of October 2007, JLCA had about 362 members including 43 industry associations, 3 other societies, 197 businesses, 68 individuals, and 51 university research organisations. About 1,000 registered users had accessed the JLCA database (Nakano et al. 2007).

A significant event in the cooperation with Japan was the publication of the special issue ‘LCA in Japan’ in 2000. Matthias Finkbeiner and Yasunari Matsuno were the editors.

Between 1993 and 1998, the Ecomaterials Project conducted systematic LCA studies. International conferences in ‘Ecobalances’ occurred biannually since 1994. “While the Japanese may not have been very active in the development of LCA *per se*, they have been at the forefront of the government-industry cooperation, specifically with the integration of life cycle concepts into decision making, reporting and public education” (Hunkeler et al. 1999).

“The conference has grown from the prior meetings in 1994 and 1996 which introduced life cycle assessment into Japanese academia and industry. The 159 papers presented from authors representing each major developed and developing regions of the globe, make the EcoBalance III Conference the largest LCA-related meeting

in the world. The Third Conference focused on the application of life cycle assessment, as well as its associated fields of life cycle management, ecodesign and life cycle thinking, towards both practical industrial cases as well as national and supranational policy related issues. The sub-theme of the conference was movement towards sustainability and, as will be discussed, significant progress has been made to evolve the life cycle concept into a practical tool. Indeed, a primary conclusion of the conference was that a move towards industrial ecology would require a shift in the development of firm based assessment methods (Design for Environment, Ecomaterial Selection, Life Cycle Assessment) to those which could be oriented towards multi-stakeholders, specifically consumers, and related in terms of market parameters such as value. The rigorous methods, via the development of ecometrics, were seen as means for validating such tools" (Hunkeler et al. 1999).

With the review on the Third International Conference on Ecobalances (ICEB), Hunkeler et al. opened a complete documentation through the 9th ICEB in Int J Life Cycle Assess:

The Third International Conference on Ecobalances Movement towards sustainability
Tsukuba, Japan, November 25–27, 1998
David Hunkeler, Ryoichi Yamamoto, Itaru Yasui
Int J Life Cycle Assess (1999): 118–120

The Fourth International Conference on Ecobalances Methodologies for decision making in a sustainable twenty-first century
Tsukuba, Japan, October 31 to November 2, 2000
David Hunkeler
Int J Life Cycle Assess (2001): 49–51

The Fifth International Conference on Ecobalances Practical tools and thoughtful principles for sustainability
November 6–8, 2002, Tsukuba, Japan
Atsushi Inaba, David Hunkeler, Gerald Rebitzer, Matthias Finkbeiner, Claude Siegenthaler s and Konrad Saur
Int J Life Cycle Assess (2003): 1–5

The Sixth International Conference on Ecobalances Development and systematizing of ecobalance tools based on life-cycle-thinking
October 25–27, 2004, Tsukuba, Japan
Yasunari Matsuno1, Norihiro Itsubo, Shigeyuki Miyamoto, Toshiharu Ikaga, Hiroki Hondo and Atsushi Inaba
Int J Life Cycle Assess (2005): 159–162

The Seventh International Conference on EcoBalances Designing our future society using systems thinking
November 25–27, 2006, Tsukuba, Japan
Hiroki Hondo1, Koji Tokimatsu, Tsuyoshi Fujita, Yasunari Matsuno, Michiyasu Nakajima, Kenichi Nakajima and Yuichi Moriguchi
Int J Life Cycle Assess (2007): 66–69

The Eighth International Conference on EcoBalances The challenge of creating social and technological innovation through system-thinking
December 10–12, 2008, Tokyo, Japan
Kenichi Nakajima and Yasunari Matsuno
Int J Life Cycle Assess (2009):577–583

The Ninth International Conference on EcoBalances Towards and beyond 2020
November 9–12, 2010, Tokyo, Japan
Keisuke Nansai, Yuki Kudoh, Hiroki Hondo, Kiyotada Hayashi, Kazuyo Matsubae, Kenichi Nakajima, Shinsuke Murakami, Masaharu Motoshita, Seiji Hashimoto, Minako Hara, Michiyasu Nakajima, Rokuta Inaba, Yasunari Matsuno, Yoshikazu Shinohara
Int J Life Cycle Assess (2011): 478–487

The Tenth International Conference on EcoBalances Challenges and solutions for sustainable society
November 22–23, 2012, Yokohama, Japan
Toshiharu Ikaga, Keio University (Chair), Shigeyuki Miyamoto, NEC Corporation (Vice chair), Hiroki Hondo*, Yokohama National University

As in previous years, the 10th ICEB attracted many participants from all over the world working in academia, industry and government. The conference had 200 people from Japan and 103 people from 22 overseas regions and nations, including: Korea, Germany, Taiwan, USA, Thailand, Switzerland, China, Finland, Indonesia, Norway, Sweden, The Netherlands, France, India, Italy, Australia, Brazil, Denmark, Ghana, Malaysia, Philippines, and Vietnam.

A further step in the close cooperation between Int J Life Cycle Assess and Japan occurred in 2007 with the introduction of a new corner to report the research activities of the Institute of Life Cycle Assessment, Japan (ILCAJ) which was founded in October 2004 (Matsuno et al. 2013).

"The goal of ILCAJ is to promote academic activities related to life-cycle thinking and to share expert knowledge with colleagues from wide-ranging backgrounds. Professor Ryoichi Yamamoto, University of Tokyo, has taken responsibility as Chairman of ILCAJ.

In April 2005, ILCAJ has successfully established its publication organ (in Japanese), The Journal of Life Cycle Assessment, Japan (J LCA Jpn). The issues appear every three months. J LCA Jpn publishes peer-reviewed research articles, commentaries and discussions, (technical) reports, lecture notes, presentations of research groups in Japan, among other" (Matsuno and Kondo 2007a, b).

Through 2010, abstracts of research articles as well as of commentaries and discussions published in J LCA Jpn were simultaneously published in Int J Life Cycle Assess, Corner: J LCA Jpn (Matsuno and Kondo 2008a, b).

5.2 Indian Society for LCA (ISLCA)

The Indian Society for LCA (ISLCA) was founded in December 1997 by NEEF—National Ecology and Environment Foundation Trust, Mumbai, India (http://www.neef.in/islca.html) (Sharma 1999, 2000).

The objectives of ISLCA include the following:

- Capacity building for the development of LCA in India through its courses, training programmes, conferences, seminars, research projects, etc,
- Integrating socio-economic concepts in LCA,
- Representing India in national and international forums on LCA and related areas,
- Networking with leading professionals in LCA and related fields,
- Promoting publications of ISLCA including its planned periodicals and newsletters, publications, videotapes, discs and other communication media.

Since 2000, Int J Life Cycle Assess has been the official publication organ of ISLCA, This means that the journal publishes a regular column about plans and activities of ISLCA (contact: Vinod K. Sharma). However, the ISLCA Corner rarely appeared, and the documentation stopped with issue no. 1, vol. 9, 2004, p. 69 (State of Environmental Product Declarations in India). Nevertheless, officially the journal still has a publication agreement with ISLCA, and NEEF has linked the journal at http://www.neef.in/index.html (link to: http://www.springer.com/environment/journal/11367).

5.3 Korean Society for LCA (KSLCA)

The Korean government introduced ISO 14040 (Environmental Management—Life Cycle Assessment—Principles and Framework) and ISO 14041 (Environmental Management—Life Cycle Assessment—Goal and Scope Definition and Inventory Analysis) as national standards (KS) and founded the Korean Society of Life Cycle Assessment (KSLCA) in 1997.

KSLCA published 3–4 newsletters and one 'technical' journal annually. The first issue appeared in 1999. Furthermore, the 2nd of the planned annual 'academic' conferences of KSLCA was held in 1999, with about 200 participants from academia and industry (Tak Hur 1999, 2000).

KSLCA was divided into four categories:

1. Policy and strategy,
2. Methodology development,
3. Database construction,
4. Case studies.

The Ministry of Commerce, Industry and Energy supported KSLCA for the development of public databases, and a 5-year national research project for the construction of national LCI databases (1998–2003) was established.

In 2003, the activities under the formal responsibility of KSLCA seemed to be on a good way (Tak Hur 2003). However, shortly thereafter, the documentation from and about the society ceased as well as contact with Prof. Tak Hur, indicating that the society ceased activity.

Outside of KSLCA Tak Hur published in 2009, together with Ik Kim, an article on 'Integration of working environment into life cycle assessment framework' (Kim and Hur 2009).

5.4 Australian LCA Society (ALCAS)

In 2001, the Australian LCA Society (ALCAS) was established (http://www.alcas.asn.au/).

"The aim of ALCAS is to promote and foster the responsible development and application of LCA methodology in Australia and internationally, with a view to contribute to 'Ecological Sustainable Development (ESD)' and to represent the Australian LCA community in the international arena. This will be achieved through:

- developing a national competence in LCA,
- fostering links with the international LCA community,
- organising a regular LCA Roundtable to facilitate information exchange and discussion on LCA amongst stakeholder groups,
- contributing to national policies, positions and approaches on LCA and its applications,
- increasing education and awareness of LCA among stakeholders including industry, academia, government, nongovernment organisations, LCA practitioners, end users and the general public" (Grant et al. 2001).

Before ALCAS was officially established and the ALCAS Corner founded in Int J Life Cycle Assess, Tim Grant (RMIT, Melbourne Victoria, Australia) reported on the 2nd National LCA Conference 'Moving from Problems to Solutions' (Grant 2000). In the meantime, the 8th conference has been planned on LCA and Carbon Footprinting, 'Pathways to Greening Global Markets' (16–18th July 2013, Sydney NSW, http://conference.alcas.asn.au/).

The ALCAS Corner was active only through 2004 (Grant et al. 2001, Editorial; Grant 2002; Grant and James 2002; James and Grant 2002; James 2003; James et al. 2003; James and Narayanaswamy 2004), but outside the Corner Karli James promoted publications on LCA activities in Australia (Foley and Lant 2009; James et al. 2002; May and Brennan 2003; Parsons 2007, 2010; Peters et al. 2010; Puri et al. 2009; Verghese et al. 2010; Ximenes and Grant 2013).

In March 2013, Barbara Nebel, the regional editor of LCANZ in Int J Life Cycle Assess (see Sect. 5.5 below) agreed to also represent ALCAS.

5.5 Life Cycle Association of New Zealand (LCANZ)

Established in 2004 as an informal network group, LCANZ (Life Cycle Association of New Zealand) (http://www.lcanz.org.nz) joined the societies in Int J Life Cycle Assess in 2005. The first documentation was published in the same year as the First

LCA Workshop/Roundtable, Rotorua, NZ, in February 2005, with about a dozen LCA practitioners from research organisations, universities and consultancies presenting overviews on current projects (Nebel and Nielsen 2005).

The Second LCA Workshop/Roundtable, Rotorua, NZ, took place exactly one year later in February 2006 (Nebel 2006). The group discussed the need for a more formal LCA platform in New Zealand.

In 2009, LCANZ was officially established, with Barbara Nebel as president (Dr. Barbara Nebel, Wellington, New Zealand), to provide a focal point for Life Cycle Assessment and Management work conducted in New Zealand.

In 2010, the First (official) New Zealand Life Cycle Assessment Conference took place, jointly organised by LCANZ and the New Zealand Life Cycle Management Centre (NZLCM) Centre. The title was 'Bridging the Gap between Tools and Practice'.

The theme for the Second New Zealand Life Cycle Assessment Conference in 2012 was 'Life Cycle Assessment: A Business Compass for Sustainable Development'. This theme reflected the increasingly important role that LCA plays in guiding and shaping business operations, management practices and strategies in New Zealand.

The main objectives of LCANZ include the following:

- Provide coordinated input to the New Zealand government on its policy development for matters relating to LCA/LCM, with a view to ensuring that government is advised of current work and the views of LCA practitioners
- Identify, prioritise and address barriers to widespread uptake of LCA/LCM, including: gaps in NZ LCA/LCM expertise, gaps in data
- Provide input into relevant standards and guidelines (national and international), where it is deemed appropriate to do so
- Review whether there is a need for professional recognition of LCA/LCM practitioners
- Facilitate access to relevant LCA/LCM experts in New Zealand
- Periodically review the need for LCA/LCM resources, and where a need is identified, facilitate the development of its/their production
- Provide technical advice on LCA/LCM work, where appropriate and feasible

5.6 Other LCA Organisations and Networks

5.6.1 SPOLD—Society for the Promotion of Life Cycle Development

SPOLD (Society for the Promotion of Life Cycle Development) started in 1992 originally as an industry association. However, other associate members (LCA consulting firms, universities, scientific institutes, etc.) later joined SPOLD.

SPOLD was a Brussels-based society created to promote the development and application of LCA. The organisation funded LCA-related scientific research, methodology development, education and communication. SPOLD brought together scientists from industry, consultancy and academia.

SPOLD identified two priority development areas to further improve the use of LCA:

1. To facilitate the public availability of life cycle inventory data, with a consistent format and with well documented data quality characteristics. SPOLD did not intend to create a new LCI database. Instead, the SPOLD database project collected all data available from different LCA stakeholders, within a consistent methodological framework. SPOLD recognised that the first task was to ensure the development of a consistent format for all the data that are available.
2. To create a constructive dialogue between industry, government, academic institutions and environmental groups to ensure broad alignment on the specific role of LCA for use in environmental decision and policy making.

SPOLD developed a common format for reporting LCI data to improve the transparency and comparability of LCI data and represent an important first step towards the establishment of a common LCI database (Singhofen et al. 1996).

As well as developing the format, SPOLD published a directory of sources of LCI data, as a first step in facilitating access to the data that were available (1995). This directory included information not only on the many reports and commercial software packages which contain LCI data, but also on the numerous data gathering initiatives which were completed or were underway under the sponsorship of industry, trade associations and national authorities (Bretz 1998; Hindle and de Oude 1996).

In 1995, SPOLD launched the project 'Winning Acceptance', to create a constructive dialogue and build consensus between the stakeholder industries, governments, environmentalists, professional groups, and academic institutions (see also SustainAbility Ltd.'s LCA Sourcebook (1993) that presents basic information on LCA techniques, practitioners, and data sources).

1998 was the last year of SPOLD's traditional role as industry's LCA sponsoring organisation. The reasons for its termination are manifold.

1. "The success of the SPOLD data format has out-grown the narrow limits of a traditional industry association" (Bretz 1998).
   The open source ecoSpold data format v1 (ecoSpold (v1)) was launched in 2000. Bo P. Weidema (http://www.lca-net.com) was instrumental in the development of the SPOLD LCI data format and database network from 1995 to 2001. Later he was executive manager of the ecoinvent database (2008 to 2012).
   The ecoinvent Centre was the first to use this data format for their own LCI database. Other databases adopted the format, and all important LCA software tools had an interface to use datasets in ecoSpold format.
2. In 1998 SETAC-Europe formed a work group on 'data availability and data quality' which comprised practically all members of SPOLD's work group 'Promoting Sound Practices', together with representatives from most important LCA data and software suppliers, and many other interested parties (Hischier et al. 2001).

3. Another issue of SPOLD, the integration of LCA into a comprehensive 'environmental toolbox' (together with MFA—Material Flow Analysis, ERA—Environmental Risk Assessment, etc.), was adopted by other organisations (LCANET and later CHAINET). The challenges of using LCA in small and medium enterprises are closely linked to those of gaining eco-efficiency improvements. The task of finding ways to stimulate and help companies in these important areas was beyond the resources of SPOLD.

5.6.2 LCANET—European Network for Strategic Life-Cycle Assessment Research and Development. A Strategic Research Programme for Life Cycle Assessment

DGXII at the European Commission subsidised a concerted action in the Environment and Climate programme for the establishment of a 'European Network for Strategic Life-Cycle Assessment Research and Development': LCANET. The task of this network was to describe the state-of-the-art of LCA methodology and to provide input to the EU Environment and Climate research and development programme.

The final document for the concerted action LCANET provided a programme for LCA research priorities in order to ensure more widespread use of LCA. It included meetings, workshops and intermediate reports. The result was the identification of the four following research themes:

1. Toolbox for life cycle assessment, including simplification, robustness, expert systems for filling data gaps and relationship to other tools
2. Decision making processes
3. LCA method development
    1. System modelling
    2. Characterisation
    3. Weighting
4. Uncertainty in all phases of LCA and the validation of software

LCANET reflected research needs as guidance to the EU 5th Environment and Climate framework programme. Int J Life Cycle Assess published a short version of the final document (Wrisberg et al. 1997) as well as a short version of the overall preface that substituted the tentative prefaces of the four reports (Udo de Haes and Wrisberg 1997a).

By 1997, LCANET had nearly 200 members. The results were supported by a wide community of European experts. Publications of LCANET results have given input to the research programme of the second phase of the 4th framework programme and to the fifth framework programme of the EU-DGXII Environment and Climate programme.

"However, it can be expected that the results will be of wider significance and will also, in a more general way, stimulate and focus LCA research and development in the

forthcoming years. It is also to hope that the work of the network can be continued" (Udo de Haes and Wrisberg 1997, *Chairman and Coordinator of LCANET*).

The complete version of the 'Final Document for the Concerted Action LCA-NET' appeared as Volume 1 of the book series 'LCA Documents' (Udo de Haes and Wrisberg 1997b).

5.6.3 CHAINET—European Network on Chain Analysis for Environmental Decision Support

CHAINET was an EU-supported Concerted Action in the Environment and Climate Programme. Similar to its predecessor I.CANET, it was a European network and addressed the use of a variety of environmental tools. The concerted action commenced in December 1997 and had a duration of two years. Helias A. Udo de Haes and Nicoline Wrisberg continued their roles as Chairman and Coordinator (Klöpffer 2004; Udo de Haes and Wrisberg 2002; Wrisberg 1998).

The Aims

- linking the different scientific tool communities, problem owners and stakeholders,
- establishing a toolbox for chain analysis,
- investigating how tools can be applied in three selected cases to suggest specific directions for design and development.

The Cases Three cases were selected as vehicles to be useful for discussions on how tools can be applied in order to get information on environmental improvements. These are the supply chain, the use chain and the waste management chain for

- automobiles,
- electronic consumer goods,
- domestic washing of clothes.

The working groups, one for each case, included:

- identify environmental problems in the chain,
- describe the results from existing environmental analyses,
- discuss relevant tools for the analysis of environmental impacts,
- formulate guidelines for the application of tools.

The final products of the project were:

The guidebook provides a toolbox for chain analysis, linking demand for environmental information with supply of relevant information. In addition it gives information on the application of the toolbox in the three cases indicating specific directions in design and development.

The network consists of environmental problem owners (stakeholders) and tool experts.

5.6.4 ISOLP—International Society for LCA Practitioners

Discussions within the board of SPOLD and at the LCANET workshop in Nordwijkershout, The Netherlands, identified a need for an organisation for LCA practitioners who did not seem to be fully represented and supported by the science-based organisations of SETAC, SETAC Europe, SPOLD, or ISO. “The [ISO] conventions which are required for allocation and similar topics … cannot be solved through science alone, but instead demand a social affirmation. A society representing the majority of practitioners would have the mandatory authority for proposing conventions which could finally enter into future improvements of the ISO 14040 series. Neither science nor industry and standardization bodies alone are able to do this. Aside from these and similar technical questions, there are other important questions of ethics and sponsor-practitioner relationships which affect all LCA practitioners throughout the world and should therefore be addressed by this prospective society” (Klöpffer 1997, Editorial).

This Editorial was supported by Laurent Grisel, Ecobilan France and Bo Weidema, IPU Denmark. It invited open discussion but did not get immediate feedback.

There were some indirect responses in 2001 and 2002 (Klöpffer and Heinrich 2001, 2002; Heinrich and Klöpffer 2002), but the actual response occurred 15 years later via the Editorial of Martin Baitz et al. (2013). It is not a direct reply to founding a society for LCA practitioners, but it picks up the discussion on how to improve cooperation in the use of LCA in both theory and practice. “The authors share the implications of LCA in daily businesses and practice and aim to nurture and strengthen the interfaces between scientific findings and application. Working together to encourage a broader application of ‘good practice’ LCA in industry as well as strengthening scientific LCA work towards ‘applicable science’ will develop and reinforce professional LCA work and technical implementation in the academic and business arena. This article is written with a primary focus on industrial applications and research in applied science and with less emphasis on specific governmental applications” (Baitz et al. 2013).

Walter Klöpffer commented on this editorial and suggested the following solution: “After publication of a new method … a further step should follow: a broad testing with real product systems. This should be done by the practitioners and financed either by industry associations or governmental and supragovernmental organizations” (Klöpffer 2013).

5.6.5 UNEP/SETAC Life Cycle Initiative

The Initiative (http://lcinitiative.unep.fr/) responds to the call by Governments around the world for a Life Cycle economy in the Malmo Declaration (2000). It contributes to the 10-Year Framework of Programmes to promote sustainable consumption and production patterns, as requested at the World Summit on Sustainable Development in Johannesburg (2002).

Due to the complementarity of the journal and the Initiative, the board of the UNEP/SETAC Life Cycle Initiative decided in 2003 to establish an official col-

laboration with Int J Life Cycle Assess to become the **Associated Journal of the UNEP/SETAC Life Cycle Initiative**.

As part of the collaboration, the journal agreed to regularly inform readers about recent developments and activities of the Life Cycle Initiative and to provide active members of the Initiative from developing countries the journal for a reduced fee.

Already before this agreement, the journal published special issue on the launch of the UNEP/SETAC Life Cycle Initiative (no. 4, vol. 7, 2002). The launch took place on 28 April 2002 during UNEP's 7th High-level Seminar on Cleaner Production, and in presence of the former SETAC President Lorraine Maltby and UNEP's Executive Director Klaus Toepfer. The latter prepared an editorial for the journal and thanked its editor-in-chief, Walter Klöpffer, not only for his valuable work in promoting Life Cycle Assessment and Life Cycle Management on an international level, but also for his support of the Life Cycle Initiative by this special issue (Toepfer 2002).

Since 2003, Int J Life Cycle Assess has been continually reporting on the Initiative's activities in the 'Corner of the UNEP/SETAC Life Cycle Initiative': for example in 2005 about progress in Life Cycle Impact Assessment within the UNEP/SETAC Life Cycle Initiative (Jolliet et al. 2005), in 2007 about the first phase 2 activities of the Initiative (Sonnemann and Valdivia 2007) and in 2011 about the process on global guidance for LCA databases (Sonnemann et al. 2011).

Furthermore, the journal has published relevant deliverables such as the LCIA Midpoint-damage Framework of the UNEP/SETAC Life Cycle Initiative in 2004 (Jolliet et al. 2004), the activity of Task Force 1 on global life cycle inventory data resource (Curran 2006) and a special issue on USEtox in 2011 (Hauschild et al. 2011).

The journal has also been helpful in announcing conferences such as CILCA (International Conference on Life Cycle Assessment) in Costa Rica in 2005 (Sonnemann 2005), the recent Indian life cycle assessment and management conference in 2012 (Datta et al. 2012; Datta and Valdivia 2013) and the United Nations Conference on Sustainable Development (Rio + 20) in 2012 (Valdivia et al. 2012) as well as in reporting on events such as in the form of key observations arising from papers on sustainable production, use and recycling of natural resources from the symposium in Portland in 2006 (Fava et al. 2006).

The sponsors of the Initiative expect this fruitful cooperation to continue in the future. As a first step, updates on recent developments in Life Cycle Impact Assessment and the finalisation and current dissemination activities of the publication on global guidance principles on LCA databases are foreseen. Moreover, special issues on Life Cycle Sustainability Assessment and global land use impacts on biodiversity and ecosystem services in LCA are under preparation.

Guido Sonnemann and Sonia Valdivia report on the Initiative in Chapter 4, this volume.

5.6.6 Swiss Discussion Forum on Life Cycle Assessment

In 2005, the Swiss Discussion Forum on Life Cycle Assessment started to report on the individual sessions in Int J Life Cycle Assess.

Mission and Organisation The Discussion Forum on Life Cycle Assessment (http://www.lcaforum.ch/) applies to practitioners from industry, consulting companies and administration and to LCA scientists, from Switzerland and abroad. Each LCA forum is dedicated to a specific topic of immediate interest related to

- experiences and challenges with LCA application in industry and administration,
- scientific questions in life cycle inventory and life cycle impact assessment methodology development,
- dissemination of new scientific findings and results of relevant LCA studies.

Each forum offers an 'open floor' session for short presentations. The topics are defined by the advisory board. Proposals are welcome.

Advisory Board

- Dr. Yves Loerincik (president)
- Dr. Arthur Braunschweig
- Norbert Egli
- Dr. Rolf Frischknecht
- Dr. Gérard Gaillard
- Prof. Stefanie Hellweg
- Roland Hischier

Peer Review/Critical Review—23rd LCA Discussion Forum The range of topics is broad (Braunschweig 2005; Doublet and Jungbluth 2011; Friot et al. 2005; Frischknecht and Flury 2011; Frischknecht et al. 2009; Loerincik et al. 2005; Saner et al. 2012; Schuerch et al. 2012; Siegenthaler and Margni 2005).

Coverage in Int J Life Cycle Assess began with the topic 'Quality Control and Peer Review' by Arthur Braunschweig (2005). Braunschweig referred to the paper 'The Critical Review Process According to ISO 14040: An Analysis of the Standard and Experiences Gained in its Application' by Walter Klöpffer (2005, the same issue and presented at the 23rd LCA Discussion Forum which took place at ETH Zurich on 23 September 2004).

'Peer Review' or 'Critical Review' has been a perennial problem from 1993 through today. A peer review for LCA-studies was first proposed in the SETAC guidelines 'A Code of Practice' (1993). SETAC recommends "the accompanying or interactive critical review, which should be preferred, over the review '*a posteriori*', which offers considerable risks in regards to the duration and costs of an LCA study" (Klöpffer 2005). In contrast, ISO 14040 describes the three methods but does not recommend any of them, which Braunschweig criticises "The forum expressed its hope that the current revision of 14040 will not increase ambiguities, but rather clarify such issues in a reasonable way" (Braunschweig 2005). From personal experience, Klöpffer leans toward supporting the recommendation by SETAC (Klöpffer 2005).

The current revision of 14040 (1997) addressed by Braunschweig (above) concerns ISO 14040: 2006 and 14044:2006 (Environmental Management—Life Cycle Assessment—Requirements and Guidelines). ISO 14040 is a framework and guidance standard, while ISO 14044 contains all technical requirements and guidelines thereon. ISO 14040:2006 and ISO 14044:2006 are the core standards of LCA. However, the contradiction between the title of Sect. 7.3.3 in ISO 14040:1997 (Critical review by panel of interested parties) and the content (this panel *may* also include other interested parties) has not been removed in the new standard of 2006. The inclusion of interested parties is again described as optional ('may' and not 'shall'). "I recommend to all commissioners of comparative LCAs to install interactive rather than 'a posteriori' critical review" (Klöpffer 2012).

In the meantime (2013), ISO TS 14071 is in development (Life cycle assessment—Critical review processes and reviewer competencies—Additional requirements and guidelines to ISO 14044:2006) and may propose how to proceed in practice.

5.6.7 LCA Activities in Spain, Italy and Greece

Spain APRODACV (Asociación Española para la Promoción del Desarrolo des Análisis del Ciclo de Vida), the Spanish Association for the promotion of LCA development, was established in 1995. It appealed to academia, industry, consulting, administration (Domenéch and Fullana 1996). The first LCA workshop in Spain, 'LCA 2000', took place (Verger 1997), and the first LCA book in Spanish appeared by Pere Fullana and Rita Puig and was reviewed by Michael Hauschild (1998).

Italy Around 1998, only the major industrial companies used LCA methodology in Italy. The main limitation to the expansion of LCA activities in small and medium companies resulted from the important investment needed (Giacomucci and Baldo 1998). However, in 1999 Giacomucci and Baldo reported on first experiences with LCA certification according to ISO 14040 (1999). Simultaneously, the LCA Society of Italy (Associazione Italiana di Analisi del Ciclo di Vita) was established (Baldo and Giacomucci 1999).

In 1997, the Italian Environmental Protection Agency ANPA (Agenzia Nazionale per la Protezione dell'Ambiente) promoted the construction of a database, called I-LCA, to support Italian LCA practitioners. The first version of I-LCA was available in 1999, and at the beginning of 2000, the second version appeared which was supported by three consulting companies: Ambiente Italia, Boustead Consulting Ltd., UK and Ecobilan, France (Baldo and Pretato 2001).

As the LCA Society of Italy failed, ENEA (Italian National Agency for New Technologies, Energy and the Environment), supported by the Ministry of Environment, promoted and coordinated the informal Italian Network on LCA—Associazione Rete Italiana LCA (Cappellaro et al. 2008, editorial).

This network runs a technical secretariat managed by ENEA, a website (www.reteitalianalca.it) and a newsletter. It organised several workshops and conferences, and finally, on June 2012, a not-for-profit scientific association was established with Paolo Masoni as president.

Greece On December 16th, 1997, the first Greek workshop on LCA was organised at the Aristotles University of Thessaloniki by the Laboratory of Heat Transfer and Environmental Engineering (LHTEE) (Moussiopoulos and Koroneos 1998a).

The Hellenic Life Cycle Assessment Network (HELCANET) was created in February 1998 by LHTEE of the Aristotle University of Thessaloniki (AUT) (Moussiopoulos and Koroneos 1998b). LHTEE is one of the first Greek bodies to get involved in LCA activities.

An impressive overview on the LCA Activities in Greece was given by Boura et al. (2000). This was the last contribution from Greece on LCA activities, but a number of scientific papers followed.

The website presents the objectives of HELCANET (http://aix.meng.auth.gr/lhtee/index.html):

- to promote and support scientific research, education, training, dissemination of information and development in the area of life cycle issues,
- to catalyse the development and application of life cycle assessment by pooling the talent and resources of industry and other organisations interested in LCA,
- to be a platform for discussion on LCA research and development by regular and rapid exchange of information between Greek universities, research institutes, companies, authorities and governmental organisations.

HELCANET focuses on social dialogue and LCA methodology development in Greece, the piloting of product and process LCA (waste management, energy systems, building materials), on ecolabelling criteria, ISO 14040, inventory, databases, data quality, impact assessment, recycling, policy, design for environment.

6 Topics and Subject Areas

As in any developing research field, new topics appear and supplement the already established ones. In 2009, the following topics and subject areas were identified and attributed to subject editors, many of who are still active in the same position (Klöpffer and Heinrich 2009):

- Carbon footprinting (Subject editor: Matthias Finkbeiner)
- Data availability, data quality in LCA (Subject editor: Martin Baitz)
- EU life cycle policy and support (Subject editor: David Pennington)
- Input–output and hybrid LCA (Sangwon Suh, Shinichiro Nakamura)
- Land use in LCA (Subject editor: Llorenç Milà I Canals)

- LCA for agriculture (Subject editors: Gérard Gaillard, Seungdo Kim)
- LCA for energy systems and food products (Subject editor: Niels Jungbluth)
- LCA of waste management systems (Subject editor: Shabbir H. Gheewala)
- LCIA of impacts on human health and ecosystems (Subject editors: Michael Z Hauschild, Rana Pant, Ralph K. Rosenbaum)
- Life cycle management (Subject editors: Gerald Rebitzer, Yasunari Matsuno, Wulf-Peter Schmidt, Thomas Swarr)
- Nontoxic impact categories associated with emissions to air, water, soil (Subject editor: Mark Huijbregts)
- Societal life cycle assessment (Subject editor: David Hunkeler)
- Uncertainties in LCA (Subject editor: Andreas Ciroth)
- Water use in LCA (Subject editor: Annette Koehler)
- Wood and other renewable resources (Subject editors: Joerg Schweinle, Barbara Nebel, Liselotte Schebek, Frank Werner)

In the following years, these issues were supplemented by Life Cycle Costing (LCC), and Life Cycle Sustainability Assessment (LCSA), among other topics.

6.1 Life Cycle Management

Life Cycle Management essentially embraces many applications of Life Cycle Thinking, product- as well as company-related LCAs and simplified methods not or not fully compliant with the ISO standards. The methods used may also go beyond (environmental) LCA and contain Life Cycle Costing (LCC) and Social Life Cycle Assessment (SLCA) as a basis for Life Cycle Sustainability Assessment (LCSA). This consideration of the 'three pillars' of sustainability is often called the 'triple bottom line' in industrial management.

The magic word in relation to LCM has been 'toolbox'. LCM uses a toolbox (i.e. several methods besides LCA such as LCC—Life Cycle Costing, DfE—Design for Environment) rather than just one well-defined method as is LCA. This allows a growing number of applications to the 'tool' LCA. This makes LCM attractive for small and medium sized enterprises and explains its success as a complement to LCA.

6.1.1 Editorial: 'How to Communicate LCA Results' by Walter Klöpffer and Almut B. Heinrich, Int J Life Cycle Assess 5(3): 125 (2000)

"How to communicate LCA results?" question Klöpffer and Heinrich the readership of the journal due to the following discussions:

1. Should methodological papers or case studies preferably be published?
2. Should the journal be divided into a fast part for news, discussions and practical applications in form of an electronic, supportive information section, and a part for scientific, peer-reviewed methodological articles?

Simultaneously, the series ISO 14040–43 was completed in March 2000. Authors and commissioners of LCA-studies had to be aware that 'comparative assertions' are only acceptable according to the international standard.

The result on this editorial was animated and controversial.

"While the editorial mostly discussed how to present LCA results it paid little attention to the question of *if* they should be published and, if so, for whom. First of all we have to recognize that it is not *a priori* clear that LCA results should be published in journals at all" (Hofstetter 2000).

"The first issue of the year 2000 contains two articles on methodology. Everything else involves valuable information for LCA-users and researchers. The Int. J. LCA must earn a good reputation and rating when articles of superior quality on methodology are seen to appear. Otherwise, the researchers will feel compelled to turn to other journals.

Accordingly, the Int. J. LCA could also appear in two parts: A 'more rapid' part for News and Discussions, and a 'slower' part for the scientific and reviewed articles" (Frischknecht 2000).

"The Int. J. LCA should endeavour to advance LCA in all its aspects. Let me support the editorial that the journal should not focus exclusively on LCA methodology. In my opinion, the essential barrier in using LCA within industry is not methodology, but the barrier is the continuing need for inventory data. To practice LCA means having the necessary data to cover all parts of the system, knowing the data's utility and uncertainty are adequate for the study's goal and scope, and making sure that the data are adequate and will fit the impact assessment methodology that you have chosen" (Owens 2000).

An event occurred that solved this problem. It was the **First International Conference on Life Cycle Management** in Copenhagen, August 27–29, 2001. This conference was initiated by Allan Astrup Jensen during the SETAC World Congress in Brighton, May 2000. Thereupon the integration of the new section 'Life Cycle Management' into the journal (2002) took place.

The LCM Conference 2001 was a fascinating event. It attracted approximately 270 participants. Plenary lectures were held on the first and third days of the conference with three parallel sessions on the second day. Fifty-three platform presentations were complimented by forty-seven posters. A special characteristic of LCM 2001 was that it attracted much more interest from businesses (multinational corporations as well as SMEs) than most conferences in this area. By the way, the CHAINET Toolbox and Network was the focus of two sessions (see Sect. 5.6.3 of this chapter). Historically, the aim of CHAINET was to broaden the scope of the preceding LCANET program, which focused on LCA. More specifically, the aim was to link demand and supply of environmental information in the field of LCM (Hunkeler et al. 2001).

There had been much discussion in the journal before the section 'Life Cycle Management' could be integrated.

6.1.2 Editorial: 'Two Planets and One Journal' by Walter Klöpffer and Almut B. Heinrich, Int J Life Cycle Assess 6(1) 1–3 (2001)

In their editorial 'Two Planets and One Journal', Klöpffer and Heinrich (2001) summarised the various expectations and demands which editors, authors and readers expressed toward the journal. The conceptions and ideas depended mainly on the planet they inhabited: the planet of the Method developers (Sect. A) and the planet of the Practitioners (Sect. B).

a. **Method developers** (Academic background)
   - High level methodological papers
   - Case studies should be published only if new methods are applied, to test the methods in real life ('Feed-back', not provided by grey literature)
   - Other case studies should be published in sector-specific journals or on the web
   - The results of such case studies are of no interest to people working in LCA, their target public is unclear
   - Separation of the Journal into a (rapid) newsletter and a slower high-level Journal of highest possible reputation and rating (Science citation index, etc.)

b. **Practitioners** (Industry)
   - The Journal should advance all aspects of LCA, not only methodology
   - The Journal should help to provide sources of inventory data, improved sources of public data!
   - The Journal should help provide the required data exchange format!
   - No objection against a well-balanced share of methodology papers, but only few people are interested
   - Case studies on a high scientific level should be the main focus, Life Cycle Management (LCM) gains importance
   - Method development comes to an end (ISO finished), but: new methods to progress science (agreement seems to be that Life Cycle Impact Assessment belongs to this group) should be published

On this basis, Klöpffer and Heinrich disseminated a questionnaire to all 53 editors of the journal in December 2000. 45 editors responded to this questionnaire with the following result:

1. Separation of peer-reviewed and non peer-reviewed contributions:
   76 % yes, 18 % no
2. Concentration on methodology papers:
   20 % yes, 69 % no
3. Concentration on case studies:
   4 % yes, 84 % no
4. Mixture of contributions (status quo):
   4 % yes, 22 % no
5. Separation of contributions within each issue:
   56 % yes, 27 % no
6. Full studies in the internet:

77 % yes, 11 % no
7. Life Cycle Management (LCM) as title or subtitle:
38 % yes, 53 % no

"We interpret these results as approval for a multitude of contributions, especially for methodology papers and case studies. For the sake of scientific reputation, however, a clear separation of peer-reviewed and non peer-reviewed contributions seems to be desirable. The comments show that a separation in two journals, as was suggested previously …, is not considered to be a good solution. Electronic publishing of comprehensive LCA-studies is considered to be promising by three quarter of the respondents. The inclusion of LCM in the title or as a subtitle polarized the board more than the numerical result can show (53 % no, 38 % yes): the comments expressed both clear refusal and enthusiasm. We shall observe the development and decide later about using LCM as a sub-title. Meanwhile, the electronic 'Gate to Environment and Health Science (Gate to EHS)', Section 'Life Cycle Management', stands wide open for peer-reviewed contributions on LCM" (Klöpffer and Heinrich 2001).

6.1.3 LCM in the Internet-Journal 'Gate to Environmental and Health Science (EHS)'[2] and the Discussion Forum 'Global LCA Village'

There was much motion and drive in the area of Life Cycle Management (Klöpffer and Heinrich 2002).

- LCM has been established in several industrial companies striving for sustainable development via life cycle-based methods
- Several articles submitted to Int J Life Cycle Assess dealt with LCM
- A working group of SETAC Europe was established in 1998 to explore the use of LCA and similar instruments in actual industrial management practice
- An international LCM conference was initiated by Allan Astrup Jensen during the SETAC World Congress in Brighton, May 2000 and successfully took place in Copenhagen, August 2001 (Hunkeler et al. 2001). Another workshop which immediately followed the congress was initiated by UNEP and SETAC in order to enlarge the profile of the UNEP/SETAC Life Cycle Initiative (Sonnemann et al. 2001)

In responding to this development including the results of the questionnaire sent in 2000 (Sect. 6.1.2 of this chapter), Walter Klöpffer and ecomed publishers[3] offered the online discussion forum 'Global LCA Village' and the area 'Life Cycle

[2] The aim of the stand-alone Internet Journal 'Gate to Environmental and Health Science (EHS)' was to expand the Scientific Journals at ecomed publishers, before they were transferred to Springer-Verlag (The International Journal of Life Cycle Assessment, Environmental Science and Pollution Research, Journal of Soils and Sediments, Umweltwissenschaften und Schadstoff-Forschung).

[3] ecomed was the publisher of the 'Scientific Journals' before they were transferred to Springer-Verlag (2008).

Management' in 'Gate to EHS' (Environmental and Health Science). 'Global LCA Village' was well-accepted and addressed LCA researchers, practitioners and industrialists. The access was free. 'Gate to EHS' was a stand-alone Internet Journal with restricted access.

The following sections in the LCM area were developed in 'Gate to EHS': Management Systems and Auditing (ed.: Matthias Finkbeiner), Life Cycle Costing (eds: David Hunkeler and Gerald Rebitzer), and Design for Environment (eds: Wulf-Peter Schmidt and Thomas E. Swarr).

Both publications ceased with the transfer of the 'Scientific Journals' (see footnote 5) to Springer-Verlag (2008). The contributions cannot be accessed anymore, not even by the DOI of the individual articles.

6.1.4 Editorial: 'LCM—Integrating a New Section' by Almut B Heinrich and Walter Klöpffer, Int J Life Cycle Assess 7(6): 315–316 (2002)

It was a difficult decision to integrate an LCM section into the journal. "In May 2002, we were still of the opinion that Int J LCA was not the optimal place for papers on LCM …. In the meantime [half a year later] we think that the journal (the printed Int J LCA) should acknowledge the developments in the LCM area more strongly. LCA, however, will remain the clear focus. LCM reflects the remaining needs that LCA alone cannot satisfy; therefore, it may be regarded as a second-generation development" (Heinrich and Klöpffer 2002).

In November 2002, Thomas E. Swarr defined LCM as such: "To me, LCM is the organising framework so we actually use the science of LCA to achieve improved performance. I find myself trying to communicate between specialists who are only comfortable with complex databases, and business executives who are only comfortable with PowerPoint bullet slides. We need a better balance between theory and practice" (Heinrich and Klöpffer 2002).

In 2006, Thomas E. Swarr referred to an LCM definition by Jensen and Remmen 2005[4]: "Life cycle management has been defined as the application of life cycle thinking to modern business practice, with the aim to manage the total life cycle of an organization's products and services toward more sustainable consumption and production" (Swarr 2006).

A specific LCM Editorial Board was responsible for the LCM papers:

- Matthias Finkbeiner, Germany
- David Hunkeler, Switzerland
- Yasunari Matsuno, Japan
- Gerald Rebitzer, Switzerland
- Wulf-Peter Schmidt, Germany
- Thomas E. Swarr, USA

[4] Jensen AA, Remmen A (2005): Background report for a UNEP guide to life cycle management, revised March, http://www.uneptie.org/pc/sustain/lcinitiative/publications.htm.

Simultaneously, four of them (Finkbeiner, Hunkeler, Matsuno, Schmidt) were regular members of the editorial board. Over the years, this separation between the regular and the specific editorial board was removed.

6.1.5 The LCM Conferences

Allan Astrup Jensen (the initiator of LCM 2001, Copenhagen, Denmark, see above), David Hunkeler, Gérard Gaillard, Stefanie Hellweg and Kim Christiansen reported on the second LCM Conference in Barcelona September 5–7, 2005 (Jensen et al. 2005). It featured some three hundred participants and was split into four parallel sessions with 125 oral presentations:

- Production systems,
- Agriculture & energy,
- Services,
- Integration tools.

During the conference over two hundred posters were exposed.

The overall message from the plenary lectures at LCM 2005 was a plea from industrialists to render LCA more relevant and applicable within a corporate context.

The third LCM Conference was held in Zürich, Switzerland, 27–29 August 2007, organised by Stefanie Hellweg and Gerald Rebitzer (see Sect. 7 of this chapter). UNEP/SETAC Life Cycle Initiative was associated. The conference discussed the theme 'From Analysis to Implementation'.

The fourth LCM Conference, LCM 2009, took place from 6–9 September 2009, in Cape Town, South Africa. The overall theme was 'The Global Challenge of Managing Life Cycles'. The conference was hosted by the University of Cape Town and supported by the United Nations Environment Program. The 180 delegates included 40 South Africans, 20 from other African countries, and 140 from as far afield as Brazil, Sweden, Japan, and Australia. This made LCM 2009 a truly global international conference.

LCM 2009 was successfully engaged with the critical questions of what it means to manage (not merely shift) the environmental and social impacts of global economic activity, what this entails for industry and public services in emerging economies, and how supply chains, networks, and partnerships can be stimulated and managed to deliver truly sustainable practice.

While the focus of the conference was LCM, LCA remains a main analytical tool for supporting LCM. This is clearly shown by the overall program in which roughly half of the contributions focused on or used LCA (Potting et al. 2010).

The fifth LCM Conference, LCM 2011, was held on August 28–31, 2011, in Berlin, Germany. Matthias Finkbeiner, Germany, was the chair and Stephan Krinke, Germany, the co-chair. The conference motto 'Towards Life Cycle Sustainability Management' addressed the challenge of implementing sustainability concepts. The conference featured 500 delegates, 180 presentations and 3 poster sessions (roughly 150 posters). The conference was documented by a separate volume 'Towards Life

Cycle Sustainability Management' edited by Matthias Finkbeiner and published by Springer[5].

The sixth LCM Conference, LCM 2013, was held in Gothenburg, Sweden, August 25–28, 2013.

The seventh LCM Conference, LCM 2015, will take place in Bordeaux, France.

First Indian Life Cycle Assessment and Management Conference 2012 A new conference series in India was initiated by the Federation of Indian Chambers of Commerce and Industry and UNEP/SETAC Life Cycle Initiative. They organised the First Indian Life Cycle Assessment and Management Conference (ILCM 2012) on 21–23 August 2012 in New Delhi, India (Datta et al. 2012).

The aim of ILCM is the application of tools for guiding governments, consumers and business towards a sustainable quality of life in India.

The key area of the conference concerned life cycle approaches regarding

- Methodology, standards, databases, etc.,
- Sustainable production,
- Sustainable consumption,
- Policy goals.

The organising team was:

- Archana Datta (archana.datta@ficci.com)
- Philip Strothmann (philip.strothmann@unep.org)
- Sonia Valdivia (sonia.valdivia@unep.org)
- Bruce Vigon (bruce.vigon@setac.org)

Second Indian life cycle assessment and management conference 2013: Creating business value through sustainable strategies (Bangalore, India, 26–27 September 2013)

Deriving inspiration from Rio + 20 Sustainable Development dialogues and suggestions of the ILCM 2012 delegates, ILCM 2013 aims to showcase practical examples. Therefore, ILCM 2013 invites policy makers, business managers and social scientists.

Topics:

- Life Cycle Approaches: Local vs global perspectives
- Life Cycle Approaches: Business opportunities and challenges in using LCA
- Life Cycle Approaches: Social LCA for developing the institutional framework in India

[5] The table of contents can be downloaded at http://download.springer.com/static/pdf/978/bfm%253A978-94-007-1899-9%252F1.pdf?auth66=1362846876_2e42d6292899f2eea084362378e7b1e4&ext=.pdf.

6.2 Life Cycle Costing (LCC)

According to Hunkeler and Rebitzer (2003), Life Cycle Management is a business toolbox involved in product- and firm-based decision-making. (Environmental) Life Cycle Costing (LCC) is part of this toolbox.

"With LCC being a major component of the new LCM section in the Int J LCA (Heinrich and Klöpffer 2002) we, the editors, hope to be able to contribute a little share to the further proliferation and implementation of LCC ideas and practices, together with other ongoing activities as the new SETAC Working Group on life cycle costing … " (Hunkeler and Rebitzer 2003; Rebitzer and Seuring 2003).

LCC is one pillar of sustainability. Sustainability comprises three pillars: environment, economy and social aspects (Rebitzer and Hunkeler 2003). "For the environmental part there is already an internationally standardized tool: Life Cycle Assessment (LCA). Life Cycle Costing (LCC) is the logical counterpart of LCA for the economic assessment. LCC surpasses the purely economic cost calculation by taking into account the use- and end-of-life phases and hidden costs" (Klöpffer 2003, 2008).

In 2011 SETAC published a code of practice for environmental life cycle costing (LCC).

"The objective of the code of practice is to provide readers with a solid understanding of how to apply LCC in parallel with LCA to stimulate additional case studies and peer-reviewed research to further refine the methodology. The ultimate goal is to build consensus for an international standard that parallels the ISO 14040 standard for LCA" (Swarr et al. 2011).

Life-cycle costing: a Code of Practice (98 pp), is published by SETAC Press and is available at https://www.setac.net/setacssa/ecssashop.show_product_detail?p_mode=detail&p_product_serno=374 for $5 for members and $12 for non-members. It is based on the deliberations of the SETAC Working Group on Life-Cycle Costing.

Being closely connected with sustainability, LCC has attracted much interest in Int J Life Cycle Assess between 2003 and 2012.

6.3 Social Life Cycle Assessment (SLCA)

"Social LCA aims at facilitating companies to conduct business in a socially responsible manner by providing information about the potential social impacts on people caused by the activities in the life cycle of their product" (Dreyer et al. 2006).

"Social life cycle assessment (S-LCA) emerged in the last years as a methodological approach aimed at evaluating social and socioeconomic aspects of products and their potential positive and negative impacts along their life cycle. According to the Guidelines for social life cycle assessment of products (Benoît and Mazijn 2009), developed within the UNEP/SETAC Life Cycle Initiative, social impacts

are those that may affect stakeholders along the life cycle of a product and may be linked to company behaviour, socioeconomic processes and impacts on social capital" (Zamagni et al. 2011).

As early as 1996, O'Brien et al. discussed the emerging theme 'Social Life Cycle Assessment' in Int J Life Cycle Assess They combined environmental life cycle assessment (ELCA) and social life cycle assessment (SLCA) and called this approach Social and Environmental Life Cycle Assessment (SELCA). "The value of the approach lies in establishing what social action, as well as what technical developments, may be undertaken in order to effect positive change within the industrial or commercial cycle under investigation" (O'Brien et al. 1996).

Since 2005 SLCA has been developing, which is reflected in Int J Life Cycle Assess "It is clear that the assessment of the social aspects of all elements of the life cycle is a critical future issue for life cycle approaches in general" (Hunkeler and Rebitzer 2005).

In 2006 David Hunkeler integrated the subject area 'Societal LCA' into the journal. "Int J LCA clearly has a lead role in the development and proliferation of LCA thinking and applications and, as such, it can become the vehicle for LCA-compatible societal assessments … " (Hunkeler 2006a).

Hunkeler defines Social Assessment as likely to be based on mid-point indicators, whereas Societal Assessment might be more macroeconomic and hence end-point based.

The goal of societal life cycle assessment is not to make decisions, but to point out tradeoffs to decision- or policy-makers (Hunkeler 2006b).

In 2004, UNEP/SETAC Life Cycle Initiative recognised the need for a task force on the integration of social criteria into LCA. The publication of the **Guidelines for Social Life Cycle Assessment**[6] **of Products** (eds Benoit and Mazijn 2009) was launched officially on 18th May, 2009, in Quebec, Canada.

These Guidelines ground the assessment of the social and socio-economic aspects into the LCA framework. The proposed framework is in line with the ISO 14040 and 14044 LCA standards but adapted for the social aspects.

The Guidelines contain four main sections:

1. The first section presents the historical context in which the guidelines should be placed. From the broad and vague concept of sustainable development to the more specific goal of sustainable consumption and production.
2. The second section explains the principles of environmental life cycle assessment and life cycle costing
3. The third section provides a technical framework for SLCA. The four major phases (goal and scope of the study, inventory analysis, impact assessment, and interpretation as outlined in ISO 14040 and 14044) of the methodology are presented.

[6] In this context, Social LCA means social and socio-economic LCA.

4. The fourth section presents the possible applications and the limitations, the communication of results, the review process, and identified research and development needs (Benoît et al. 2010).

The 2nd International Seminar in Social Life Cycle Assessment was held on 5 and 6 May 2010 in Montpellier. It was a follow-up to the first seminar held in Lyngby at the Denmark Technology University on 31 May 2010, initiated by Louise Camilla Dreyer.

The variety of speeches highlighted the different methodologies in social LCA which concurrently have emerged (Macombe et al. 2011)

- Management SLCA is devoted to internal decision making within a value chain and to the identification of social hot spots.
- Consequential LCA aims to assess the social impacts caused by choosing between decision alternatives.
- Educative SLCA communicates the preference of the decision maker to the market.

6.4 Life Cycle Sustainability Assessment (LCSA)

"Sustainable development is development that meets the needs of present without compromising the ability of future generations to meet their own needs" (Brundtland Report[7]).

"The concept of 'sustainable development' (or 'sustainability') was introduced by the United Nations in the Brundtland declaration but has eluded precise definition. In very broad terms, sustainable development means a pattern of human activity that is consistent with the ecological and thermodynamic maintenance of the planet, which is technically and economically viable, and which meets people's needs and expectations …. The idea is summed up in Fig. 5.1. 'Sustainable Development' is the area at the centre of the diagram where the 'natural', 'techno-economic' and 'social' intersect" (O'Brien et al. 1996).

Figure 5.1 in the article by O'Brien, Alison Doig and Roland Clift (1996) is a convincing illustration of 'Sustainable development' in Int J Life Cycle Assess (Fig. 5.4).

"Sustainability—a term originating from silviculture, which was adopted by UNEP as the main political goal for the future development of humankind—is also the ultimate aim of product development. It comprises three components: environment, economy and social aspects which have to be properly assessed and balanced if a new product is to be designed or an existing one is to be improved" (Klöpffer 2008).

[7] The Brundtland Report of 1987 is also known as Our Common Future. Formally known as the 'World Commission on Environment and Development' (WCED), the Brundtland Commission's mission was to unite countries to pursue sustainable development. The Chairman of the Commission was Gro Harlem Brundtland, Norway.

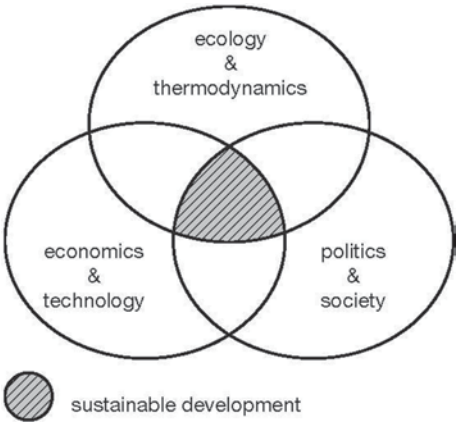

Fig. 5.4 Components of sustainable development

There is not much difference between the two definitions of 'Sustainability' by O'Brien et al. in 1996 and Klöpffer in 2008. They ground on the 'three pillar equation' or 'triple bottom line'. This interpretation means that, for achieving and assessing sustainability, the environmental (LCA), economic (LCC) and social (SLCA) aspects have to be integrated.

The idea of combining three LCA techniques (methods) into an LCSA was first formulated by Walter Klöpffer (2008), followed by Matthias Finkbeiner et al. (2010).

$$\text{LCSA} = \text{LCA} + \text{LCC} + \text{SLCA}$$

LCSA: Life Cycle Sustainability Assessme
LCA: (environmental) Life Cycle Assessment
LCC: (environmental) Life Cycle Costing
SLCA: Social Life Cycle Assessment

Valdivia et al. (2012) identified that, while LCSA is feasible, the following areas need more development: data production and acquisition, methodological development, discussion about LCSA criteria (e.g. cutoff rules), definitions and formats of communication and dissemination of LCSA results and the expansion of research and applications combining (environmental) LCA, LCC and SLCA.

Alessandra Zamagni, the subject editor for LCSA in Int J Life Cycle Assess, invited practitioners and method developers to submit articles addressing the full range of sustainability-related topics, also case studies, methodological developments, discussions about data availability, and thus how the present software tools can deal with such evaluation are encouraged (Zamagni 2012; Zamagni et al. 2013).

From the preface:

"SLCA has been neglected in the past, but is now beginning to be developed. One of the challenges is how to relate the social indicators (social impact assessment) to the functional unit of the product-system and how to restrict the many social indica-

tors proposed to a manageable number. Meanwhile, qualitative and semi-quantitative approaches are used as substitutes for a full, quantitative SLCA. It is hoped that new methods will be developed and finally standardised by ISO. The combination of LCA, LCC and SLCA, represented by the three-pillar equation LCSA = LCA + LCC + SLCA, will provide the much needed tool for sustainability assessment of products.

However, broadening indicators is not enough, since it is also necessary to further sophisticate and deepen the modelling, in order to address complexities and sustainability questions along the full range of scales (from local to global), taking more mechanisms and relations into account. Mechanisms are connecting links between activities and they can show up everywhere, involving a variety of domains and giving rise to different consequences. Market mechanisms are part of broader economic mechanisms, which recall concepts like employment and growth. These in turn function within a cultural, social, political and regulatory context. All of this could be achieved through the development of new approaches or through the combination or integration of LCA with other methods, while managing or counteracting the resulting increase in complexity".

The following questions, raised by Alessandra Zamagni (2012), still need to be answered:

- How can the LCSA framework be consistently applied, considering also the different degree of maturity of the three methods?
- What role does scenario modelling play in the LCSA framework?
- What other approaches to LCSA can be proposed than the three separate assessments?
- What approaches exist for including mechanisms in the analysis? How can different domains, normative positions (values) and empirical knowledge be dealt with? How can future changing structures of the economy be accounted for? And what kind of methods and tools can be used, combined and/or integrated?
- What do we need to further develop LCSA? What research strategies and lines are considered relevant?
- How can uncertainty, which is an inevitable and inherent characteristic of sustainability assessment, be accommodated and managed?

7 Special Issues and Supplements

Int Journal of Life Cycle Assess distinguishes between special issues and supplemental issues, although both were generally referred to as 'special issues' until recently[8]. Both are edited by invited guest editors. Special issues belong to the regular series of printed issues, with the title and the names of the guest editors printed on the cover. Supplements appear outside of the regular series and are paid by the commissioner; articles have to be cited as "Author(s) (year) Title of the paper Int J Life Cycle Assess (Vol No) Supplement No, first page—last page."

[8] The distinction between 'special issue' and 'supplemental issue' was enacted with the transfer of the journal to Springer-Verlag in 2008.

The first Special Issue in Int J Life Cycle Assess was published in 1996 and 1997, in the first and second volume of the journal. It was called 'Taormina Issue' and consisted of 13 selected papers from the 6th SETAC Europe Meeting on May 19–22, 1996 in Taormina, Sicily. This Taormina issue created the beginning of an ongoing publication of special issues and supplements in the journal.

Special issues include the following topics and editors:

- Selected Papers from the 6th SETAC Europe Meeting, May 19–22, 1996, Taormina, Sicily (vol. 1 and 2, 1996). Special Edition Editor: Allan Astrup Jensen; co-editors: Roland Clift, Patrick Hofstetter and Dennis Postlethwaite
- The MIIM LCA Ph.D. Club. Special issue vol. 4, 1999, vol. 5, 2000
- LCA in Japan. Special issue vol. 5, no. 5, 2000. Special Edition Editors: Matthias Finkbeiner and Yasunari Matsuno
- The International Conferences on Life Cycle Assessment
  - The International Conference on Life Cycle Assessment, Arlington, Virginia, USA, 2000. Special issue vol. 6, no. 2, 2001. Special Edition Editors: Mary Ann Curran and Rita Schenck
  - The International Conference Life Cycle Assessment/Life Cycle Management: A Bridge to a Sustainable Future, Seattle, Washington, USA, 2003. Special issue vol. 9, no. 6, 2004 and vol. 10, 2005. Special Edition Editor: Mary Ann Curran
- OMNIITOX (Operational Models aNd Information tools for Industrial applications of eco/TOXicological impact assessments). Special issue vol. 9, no. 5, 2004. Special Edition Editor: David W. Pennington.
- The ecoinvent database. Special issue vol. 10, no. 1, 2005. Special Edition Editor: Rolf Frischknecht
- 'Sustainable Management of Natural Resources in an Life-cycle Perspective'. Special Issue vol. 11, no. 1, 2006, inspired by the SETAC World Conference in Portland (USA), November 2004 (in co-operation with the UNEP/SETAC Life Cycle Initiative). Special Edition Editor: Helias A Udo de Haes
- Honouring Helias Udo de Haes. Special issue vol. 11, no. 1, January 2006. Special Edition Editors: Mark AJ Huijbregts, Jeroen B Guinée, Gjalt Huppes, José Potting
- LCM 2007 Zurich—From Analysis to Implementation. 3rd International Conference on Life Cycle Management, Zurich, August 27–29, 2007. Special issue vol. 12, no. 1, August 2007. Special Edition Editors: Gerald Rebitzer, Stefanie Hellweg, Annette Koehler
- Life Cycle Performance of Aluminium Applications. Supplement vol. 14, no. 1, May 2009. Special Edition Editors: Gerald Rebitzer, Jörg H Schäfer
- LCIA of impacts on human health and ecosystems (USEtox). Special issue vol. 16, no. 8, September 2011. Special Edition Editors: Michael Z Hauschild, Olivier Jolliet, Mark AJ Huijbregts
- Promotion of Young Scientists in LCA. Special issue vol. 17, no. 9, November 2012. Special Edition Editor: Liselotte Schebek

- Global Land Use Impacts on Biodiversity and Ecosystem Services in LCA. Special issue vol. 18, no. 6, July 2013. Special Edition Editors: Thomas Koellner, Roland Geyer
- Life Cycle Sustainability Assessment: From LCA to LCSA. Special issue vol. 18, no. 9, November 2013. Special Edition Editors: Alessandra Zamagni, Hanna-Leena Pesonen, Thomas Swarr

8 ISO Standardisation of LCA

International standards for LCA were developed since the 1990s by ISO Technical Committee (TC) 207 (Environmental Management) as part of the ISO 14,000 family of environmental management standards. The committee within ISO/TC207 dealing with LCA is Subcommittee 5 (SC5). So the complete name of the LCA unit is ISO/TC207/SC5.

A comprehensive coverage of the history, present, and future of the ISO standardisation of LCA is given by Matthias Finkbeiner in Chapter 3, this volume[9] (Finkbeiner 2013).

"International standards on Life Cycle Assessment are only significant if they make the necessary practical instructions without extending into regulations which may be far too detailed. In other words, a balance must be achieved between the unavoidable establishment and the possibility of interpreting these regulations more or less freely" (Marsmann 2000).

The articles on ISO-LCA in Int J Life Cycle Assess (Table 5.1) reflect the development of the standardisation process.

This division of LCA methodology into successive phases was directly inspired by the SETAC 'Code of Practice'(1991) which was the most authoritative publication to be referred to.

ISO 14040 (1997) = Principles and framework
ISO 14041 (1998) = Goal and scope definition, inventory
ISO 14042 (2000) = Impact assessment
ISO 14043 (2000) = Interpretation (formerly 'Improvement')
ISO 14040 and ISO 14044 (2006) have become the commonly accepted rules for LCA. They are the 'core standards':
ISO 14040: Environmental Management—Life Cycle Assessment—Principles and Framework
ISO 14044: Environmental Management—Life Cycle Assessment—Requirements and Guidelines

[9] The international standards as the constitution of LCA: the ISO 14040 series and its offspring by Matthias Finkbeiner.

Table 5.1 Articles on LCA ISO standardisation in Int J Life Cycle Assess

ISO 14040	Environmental Management – Life Cycle Assessment – Principles and Framework (1997 and 2006)	Int J Life Cycle Assess (1997) 2(3): 121 ISO 14040 Angela Merkel Int J Life Cycle Assess (1997) 2(3): 122−123 ISO 14040 − The First Project Manfred Marsmann "The introduction of ISO 14040 sets a process in motion which is now unstoppable. Within a short period of time we shall have four standards which combine the elements of life cycle assessment, as far as this is possible, in a way which is comprehensive yet practical, standardised yet flexible and precise yet comprehensible." Int J Life Cycle Assess (1997) 2(4): 183−184 Peer (Expert) Review in LCA According to SETAC and ISO 14040 − Theory and Practice Walter Klöpffer	Int J Life Cycle Assess (1997) 2(1): 2−4 **Special Issue: Current LCA-ISO Activities** Foreword − Development of Life Cycle Thinking − ISO Standards − Standardization of − Environmental Balances: ISO 14040 − Subsequent Standards − Inventory: ISO 14 041 − Life Cycle Impact Assessment: ISO 14 042 − Interpretation of Results: ISO 14043 Manfred Marsmann, Hans-Jürgen Klüppel, Konrad Saur Int J Life Cycle Assess (1997) 2(2): 64–65 **Special Issue: Current LCA-ISO Activities** Brief Result Report of WGs of SC 5 'Life Cycle Assessment' on the Kyoto Meeting of the ISO/TC 207 Gertraud Goldhan, Sabine Schlüter
ISO 14041	Environmental Management – Life Cycle Assessment – Goal and Scope Definition and Inventory Analysis (1998)	Int J Life Cycle Assess (1997) 2(1): 5−8 Goal and Scope Definition and Life Cycle Inventory Analysis Hans-Jürgen Klüppel Int J Life Cycle Assess (1998) 3(6): 301 Goal and Scope Definition and Life Cycle Inventory Analysis Hans-Jürgen Klüppel	Int J Life Cycle Assess (2000) 5(6): 317–318 The ISO 14040 Family Manfred Marsmann
ISO 14042	Environmental Management – Life Cycle Assessment – Life Cycle Impact Assessment (2000)	Int J Life Cycle Assess (1997) 2(2): 66−70 Life Cycle Impact Assessment Konrad Saur Int J Life Cycle Assess (1998) 3(4): 180−181 Letter to the Editor ISO 14042 Restricts Use and Development of Impact Assessment Commentary by Edgar G. Hertwich and William S. Pease Int J Life Cycle Assess (1999) 4(2): 65 Letter to the Editor In Reply to Hertwich & Pease,	Int J Life Cycle Assess (2002) 7(1): 1 The ISO Standardization Process: Quo Vadis? Hans-Jürgen Klüppel Int J Life Cycle Assess (2005)10(3): 165 The Revision of ISO Standards 14040−14043 ISO 14040: Environmental management – Life cycle assessment – Principles and framework ISO 14044: Environmental management – Life cycle

Table 5.1 (continued)

		Int. J. LCA 3 (4) 180–181, 'ISO 14042 Restricts Use and Development of Impact Assessment' Manfred Marsmann, Sven Olaf Ryding, Helias Udo de Haes, James Fava, Willie Owens, Kevin Brady, Konrad Saur, Rita Schenck Int J Life Cycle Assess (1999) 4(2): 75–80 Commentary Article How Does ISO/DIS 14042 on Life Cycle Impact Assessment Accommodate Current Best Available Practice? Helias A. Udo de Haes, Olivier Jolliet Int J Life Cycle Assess (1999) 4(6): 307 ISO 14042 Sven-Olof Ryding	assessment – Requirements and guidelines Hans-Jürgen Klüppel Int J Life Cycle Assess (2006) 11(2): 80–85 The New International Standards for Life Cycle Assessment: ISO 14040 and ISO 14044 Matthias Finkbeiner, Atsushi Inaba, Reginald B.H. Tan, Kim Christiansen, Hans-Jürgen Klüppel Int J Life Cycle Assess (2012) 17(9): 1087–1093 The critical review of life cycle assessment studies according to ISO 14040 and 14044: Origin, purpose and practical performance Walter Klöpffer
ISO 14043	Environmental Management – Life Cycle Assessment – Life Cycle Interpretation (2000)	Int J Life Cycle Assess (1997) 2(1): 8–10 Life Cycle Interpretation − A Brand New Perspective? Konrad Saur "In my personal opinion, the interpretation step is the key element toward reliability and an acceptance of the whole LCA framework." Int J Life Cycle Assess (1999) 4(5) 245 ISO 14043 – Life Cycle Interpretation Henri Lecouls	Int J Life Cycle Assess (2013) 18(2):300–301 Letter to the Editor-in-Chief: Regarding your article 'The critical review of life cycle assessment studies according to ISO 14040 and 14044—origin, purpose and practical performance', Int J Life Cycle Assess (2012) 17: 1087–1093. Christoph Koffler
ISO 14044	Environmental Management – Life Cycle Assessment − Requirements and Guidelines (2006)	Int J Life Cycle Assess (2005) 10(6): 381 Letter to the Editor ISO 14044 also Applies to Social LCA Bo Weidema	Int J Life Cycle Assess (2013) 18(1): 1–4 From the 40s to the 70s—the future of LCA in the ISO 14000 family Matthias Finkbeiner

9 Conclusion

The International Journal of Life Cycle Assessment is still the only scientific journal devoted entirely to LCA methods and LCM application. Over the years, its scope broadened with the development of life-cycle based methods exceeding the classical LCA, as defined by SETAC (1993) and ISO (1997 ff.).

From the beginning, the journal has been a harbour for LCA societies around the world. In 2003, the UNEP/SETAC Life Cycle Initiative established an official collaboration with the Journal, making it the Associated Journal of the UNEP/SETAC

Life Cycle Initiative. Although some societies ceased their regular documentation after a few years, societies have been important contributors of editorials and scientific papers. This is evidence that the association with Int J Life Cycle Assess has been functional and successful.

The basic editing philosophy, namely to publish method developments as well as applied papers, has not been changed since the first issue. Each article has to present new information or data, such as previously undisclosed foreground data, or advance understanding and knowledge in the field. As a new variant is identified as sufficiently matured (at least to a certain degree), motivated editors are invited to develop the special field.

Furthermore contributions from remote areas of the world are very welcomed. The journal editors continue to strive to maintain truly global authorship and readership while ensuring confidence in the scientific level and the practical usefulness of the journal's contributions to the open literature.

References

Baitz M, Albrecht S, Brauner E, Broadbent C, Castellan G, Conrath P, Fava J, Finkbeiner M, Fischer M, Fullana i Palmer P, Krinke S, Leroy C, Loebel O, McKeown P, Mersiowsky I, Möginger B, Pfaadt M, Rebitzer G, Rother E, Ruhland K, Schanssema A, Tikana L (2013) Editorial. LCA's theory and practice—like ebony and ivory living in perfect harmony? Int J Life Cycle Assess 18(1):5–13

Baldo GL, Giacomucci A (1999) The LCA society of Italy. Int J Life Cycle Assess 4(4):228

Baldo GL, Pretato U (2001) A database to support Italian LCA practitioners. Int J Life Cycle Assess 6(3):180

Baumann H (2002) Letter to the editor: Int J LCA could have received better acknowledgement. Int J Life Cycle Assess 7(1):2–3

BenoÈt C, Mazijn B (2009) (eds) Guidelines for social life cycle assessment of products. Paris. http://lcinitiative.unep

Benoît C, Norris GA, Valdivia S, Ciroth A, Moberg A, Bos U, Prakash S, Ugaya C, Beck T (2010) The guidelines for social life cycle assessment of products: just in time! Int J Life Cycle Assess 15:156–163

Boura A, Koroneos CJ, Moussiopoulos N (2000) Overview of LCA activities in Greece from LHTEE. Int J Life Cycle Assess 5(4):203–204

Braunschweig A (2005) Quality control and peer review. The 23rd LCA discussion forum at ETH Zürich (23rd September 2004). Int J Life Cycle Assess 10(2):158

Bretz R (1998) SPOLD (editorial). Int J Life Cycle Assess 3(3):119–120

Cappellaro F, Scalbi S, Masoni P (2008) The Italian network on LCA (editorial). Int J Life Cycle Assess 13(7):523–525

Curran MA (2006) Report on activity of task force 1 in the life cycle inventory programme: Data registry—global life cycle inventory data resources. Int J Life Cycle Assess 11(4):284–289

Datta A, Valdivia S (2013) Indian life cycle assessment and management conference (ILCM) 2013 creating business value through sustainable strategies. Int J Life Cycle Assess 18(5):1173

Datta A, Strothmann P, Valdivia S, Vigon B (2012) First Indian life cycle assessment and management conference 2012. Int J Life Cycle Assess 17(7):944–945

Domenéch X, Fullana P (1996) LCA association in Spain. Int J Life Cycle Assess 1(4):207

Doublet G, Jungbluth N (2011) Environmental product information (EPI) and LCA, Ittingen-Berne, Switzerland, June 22, 2010. 41st LCA Swiss discussion forum. Int J Life Cycle Assess 16:90–94

Dreyer L, Hauschild M, Schierbeck J (2006) A framework for social life cycle impact assessment. Int J Life Cycle Assess 11(2):88–97
Fava J, Sonnemann G, Gloria T (2006) Key observations arising from papers on sustainable production, use and recycling of natural resources. Int J Life Cycle Assess 11(1):75–76
Finkbeiner M (2013) From the 40s to the 70s—the future of LCA in the ISO 14000 family (editorial). Int J Life Cycle Assess 18:1–4
Foley J, Lant P (2009) Regional normalisation figures for Australia 2005/2006—inventory and characterisation data from a production perspective. Int J Life Cycle Assess 14:215–224
Friot D, Loerincik Y, Jolliet O (2005) Life cycle approaches for green investment. 26th LCA Swiss discussion forum. Int J Life Cycle Assess 10(6):454–456
Frischknecht R (2000) How or to whom do we communicate LCA results? Comments to the editorial in Int. J. LCA 5 (3) 125 (2000) by Rolf Frischknecht. Int J Life Cycle Assess 5(4):187
Frischknecht R, Flury K (2011) Life cycle assessment of electric mobility: answers and challenges—Zurich, April 6, 2011. 43rd LCA Swiss discussion forum. Int J Life Cycle Assess 16:691–695
Frischknecht R, Büsser S, Krewitt W (2009) Environmental assessment of future technologies: how to trim LCA to fit this goal? 38th LCA Swiss discussion forum. Int J Life Cycle Assess 14:584–588
Giacomucci A, Baldo GL (1998) LCA activities in Italy. Int J Life Cycle Assess 3(2):68
Giacomucci A, Baldo GL (1999) LCA certification according to ISO 14.040—first experience. Int J Life Cycle Assess 4(3):165–166
Grant T (2000) Moving from problems to solutions—2nd national LCA conference, Melbourne, Australia 23rd to 24th February 2000. Int J Life Cycle Assess 5(2):74
Grant T (2002) The third Australian conference on life cycle assessment (conference report). Int J Life Cycle Assess 7(5):308
Grant T, James K (2002) Australian LCA society (ALCAS). Int J Life Cycle Assess 7(3):177
Grant T, James KL, Lundie S (2001) Australian LCA society (editorial). New LCA group to promote life cycle assessment in Australia. Int J Life Cycle Assess 6(6):323–324
Hauschild M (1998) Book review. Analisis del ciclo de vida—life cycle assessment in Spanish. Authors: Pere Fullana, Rita Puig. Int J Life Cycle Assess 3(1):56
Hauschild MZ, Jolliet O, Huijbregts MA (2011) LCIA of impacts on human health and ecosystems (USEtox). A bright future for addressing chemical emissions in life cycle assessment (editorial). Int J Life Cycle Assess 16(8):697–700
Heinrich AB, Klöpffer W (1999) Online-first. Int J Life Cycle Assess 4(6):340
Heinrich AB, Klöpffer W (2002) LCM—integrating a new section in Int J LCA (editorial). Int J Life Cycle Assess 7(6):315–316
Hindle P, De Oude NT (1996) SPOLD—society for the promotion of life cycle development. Int J Life Cycle Assess 1(1):55–56
Hischier R, Baitz M, Bretz R, Frischknecht R, Jungbluth N, Marheineke sT, McKeown P, Oele M, Osset P, Renner I, Skone T, Wessman H, De Beaufort ASH (2001) SETAC Europe LCA working group 'Data Availability and Data Quality'. Guidelines for consistent reporting of exchanges from/to nature within life cycle inventories (LCI). Int J Life Cycle Assess 6(4):192–198
Hofstetter P (2000) How or to whom do we communicate LCA results? Comments to the editorial in Int. J. LCA 5 (3) 125 (2000) by Patrick Hofstetter. Int J Life Cycle Assess 5(4):187
Hunkeler D (2006a) Societal assessment—a new subject area and call for papers. Int J Life Cycle Assess 11(2):86
Hunkeler D (2006b) Societal LCA methodology and case study. Int J Life Cycle Assess 11(6):371–382
Hunkeler D, Rebitzer G (2003) Life cycle costing—paving the road to sustainable development? Int J Life Cycle Assess 8(2):109–110
Hunkeler D, Rebitzer G (2005) The future of life cycle assessment. Int J Life Cycle Assess 10(5):305–308
Hunkeler D, Yamamoto R, Yasui I (1999) Life cycle assessment: from Adam Smith to Aristotle. A review of the Third International Conference on Ecobalances. Tsukuba, Japan, November 25–27, 1998

Hunkeler D, Rebitzer G, Jensen AA, Margni M (2001) Life cycle management—bridging the gap between science and application. Report from LCM 2001—First international conference on life cycle management, Copenhagen, August 27–29, 2001. Int J Life Cycle Assess 6(6):384–390

Hunkeler D, Suh S, Finnveden G, Fava J, Udo deHHA, Baitz M, Finkbeiner M, Young A, Heinrich AB (2008) Dedicated to Walter Klöpffer on the occasion of his anniversary on 6 June 2008. Int J Life Cycle Assess 13(3):177

Itsubo N (1999a) The progress of the impact assessment study committee in the national LCA project of Japan. Int J Life Cycle Assess 4(4):194

Itsubo N (1999b) The progress of inventory study committee WG2 in the national LCA project in Japan. Int J Life Cycle Assess 4(5):246

Itsubo N (2000) Launch of the damage function sub-committee in the national LCA project of Japan. Int J Life Cycle Assess 5(2):84

James K (2003) Water issues in Australia—an LCA perspective. Summary of presentations made at the ALCAS LCA Roundtable held Wednesday 7th May 2003. Int J Life Cycle Assess 8(4):242

James K, Grant T (2002) What's happening in Australia? Int J Life Cycle Assess 7(1):4

James K, Narayanaswamy V (2004) ALCAS: best practice seminar and announcement of forthcoming 2005 conference. Int J Life Cycle Assess 9(4):214–215

James K, Grant T, Sonneveld K (2002) Stakeholder involvement in Australian paper and packaging waste management LCA study. Int J Life Cycle Assess 7(3):151–157

James K, Beavis P, Grant T (2003) ALCAS: reflections upon 2002 and looking ahead to 2003. Int J Life Cycle Assess 8(1):49

Jensen AA, Hunkeler D, Gaillard G, Hellweg S, Christiansen K (2005) LCM 2005—innovation by life cycle management. Barcelona, 5–7 September 2005. Int J Life Cycle Assess 10(6):451–453

Jolliet O, Müller-Wenk R, Bare J, Brent A, Goedkoop M, Heijungs R, Itsubo N, Peñia C, Pennington D, Potting J, Rebitzer G, Stewart M, Udo deHH, Weidema B (2004) The LCIA midpoint-damage framework of the UNEP/SETAC Life Cycle Initiative. Int J Life Cycle Assess 9(6):394–404

Jolliet O, Dubreuil A, Gloria T, Hauschild M (2005) Progresses in life cycle impact assessment within the UNEP/SETAC Life Cycle Initiative. Int J Life Cycle Assess 10(6):447–448

Kim I, Hur T (2009) Integration of working environment into life cycle assessment framework. Int J Life Cycle Assess 14:290–301

Klöpffer W (1996) Editorial. Int J Life Cycle Assess 1(1):3

Klöpffer W (1997) ISOLP—do we truly require an international society for LCA practitioners (editorial)? Int J Life Cycle Assess 2(1):1

Klöpffer W (2003) Life-cycle based methods for sustainable product development. Int J Life Cycle Assess 8(3):157–159

Klöpffer W (2004) Analytical tools for environmental design and management in a systems perspective. The combined use of analytical tools (book review). Int J Life Cycle Assess 9(2):137

Klöpffer W (2005) The critical review process according to ISO 14040–43. An analysis of the standards and experiences gained in their application. Int J Life Cycle Assess 10(2):98–102

Klöpffer W (2007) Publishing scientific articles with special reference to LCA and related topics. Int J Life Cycle Assess 12(2):71–76

Klöpffer W (2008) State-of-the-art in life cycle sustainability assessment (LCSA). Life cycle sustainability assessment of products (with comments by Helias A. Udo de Haes, p. 95). Int J Life Cycle Assess 13(2):89–95

Klöpffer W (2012) The critical review of life cycle assessment studies according to ISO 14040 and 14044—origin, purpose and practical performance. Int J Life Cycle Assess 17(9):1087–1093

Klöpffer W (2013) Comment on the editorial note by Baitz et XXI aliis. Int J Life Cycle Assess 18(1):14–16

Klöpffer W, Heinrich AB (1999) Can you imagine the LCA world without our journal (editorial)? Int J Life Cycle Assess 4(4):183

Klöpffer W, Heinrich AB (2001) Two planets and one journal (editorial). Int J Life Cycle Assess 6(1):1–3

Klöpffer W, Heinrich AB (2002) Life cycle management (LCM) (editorial). Int J Life Cycle Assess 7(3):133
Klöpffer W, Heinrich AB (2009) How to communicate LCA results (editorial). Int J Life Cycle Assess 5(3):125
Loerincik Y, Kaenzig J, Jolliet O (2005) Life cycle approaches for sustainable consumption. 24th LCA Swiss discussion forum. Int J Life Cycle Assess 10(3):228–229
Macombe C, Feschet P, Garrabé M, Loeillet D (2011) 2nd international seminar in social life cycle assessment—recent developments in assessing the social impacts of product life cycles. Int J Life Cycle Assess 16:940–943
Marsmann M (2000) The ISO 14040 family (editorial). Int J Life Cycle Assess 5(6):317–318
Matsuno Y, Kondo Y (2007a) Corner: J LCA Jpn (The Journal of Life Cycle Assessment Japan) Eds Yasunari Matsuno Yasushi Kondo Announcing the collaboration between Int J LCA J LCA Jpn. Int J Life Cycle Assess 12(6):348–350
Matsuno Y, Kondo Y (2007b) Corner: J LCA Jpn (The Journal of Life Cycle Assessment Japan) Eds Yasunari Matsuno Yasushi Kondo The collaboration between Int J LCA J LCA Jpn. Int J Life Cycle Assess 12(7):547–549
Matsuno Y, Kondo Y (2008a) Corner: J LCA Jpn (The Journal of Life Cycle Assessment, Japan). Eds Yasunari Matsuno and Yasushi Kondo. The collaboration between Int J LCA and J LCA Jpn. Int J Life Cycle Assess 13(1):10–11, 13(2):168–171
Matsuno Y, Kondo Y (2008b) The collaboration between Int J Life Cycle Assess and J LCA Jpn. Int J Life Cycle Assess 13(7):605–608
Matsuno Y, Itsubo N, Hondo H, Nakano K (2013) LCA in Japan in the twenty-first century. Int J Life Cycle Assess 18(1):278–284
May JR, Brennan DJ (2003) Application of data quality assessment methods to an LCA of electricity generation. Int J Life Cycle Assess 8(4):215–225
Morimoto M (1997) JLCA Corner: activities of the life-cycle assessment society of Japan (JLCA). Int J Life Cycle Assess 2(3):153
Moussiopoulos N, Koroneos CJ (1998a) First LCA workshop in Greece. Int J Life Cycle Assess 3(5):288
Moussiopoulos N, Koroneos CJ (1998b) Hellenic life cycle assessment network (HELCANET). Int J Life Cycle Assess 3(5):272
Nakahara Y (1999) The progress of the database study committee in the national LCA project of Japan. Int J Life Cycle Assess 4(6):310
Nakano K, Nakaniwa C, Kabeya T, Iguchi T, Aoki R (2007) Current activities of the life cycle assessment society of Japan. Int J Life Cycle Assess 12(7):546
Nebel B (2006) Second LCA workshop/roundtable, Rotorua, Scion, NZ, February 2006. Int J Life Cycle Assess 11(4):292–293
Nebel B, Nielsen PS (2005) LCA Workshop/roundtable, Rotorua, Forest Research, NZ, February 2005. Int J Life Cycle Assess 10(5):375–376
O'Brien M, Doig A, Clift R (1996) 6th SETAC Europe meeting: LCA—selected papers. Social and environmental life cycle assessment (SELCA). Approach and methodological development. Int J Life Cycle Assess 1(4):231–237
Owens W (2000) How or to whom do we communicate LCA results? Comments to the Editorial in Int. J. LCA 5 (3) 125 (2000) by William Owens. Int J Life Cycle Assess 5(4):188
Parsons D (2007) The environmental impact of disposable versus re-chargeable batteries for consumer use. Int J Life Cycle Assess 12(3):197–203
Parsons D (2010) Home heating in temperate Australia. Int J Life Cycle Assess 15:785–793
Peters GM, Wiedemann SG, Rowley HV, Tucker RW (2010) Accounting for water use in Australian red meat production. Int J Life Cycle Assess 15:311–320
Potting J, Curran MA, von Blottnitz H (2010) From life cycle talking to taking action. The 4th international conference on life cycle management—the global challenge of managing life cycles. Int J Life Cycle Assess 15:326–329
Puri P, Compston P, Pantano V (2009) Life cycle assessment of Australian automotive door skins. Int J Life Cycle Assess 14:420–428

Rebitzer G, Hunkeler D (2003) Life cycle costing in LCM—ambitions, opportunities, and limitations (editorial). Discussing a framework. Int J Life Cycle Assess 8(5):253–256 (2003
Rebitzer G, Seuring S (2003) Life cycle costing—a new SETAC Europe working group. Methodology and application of life cycle costing. Int J Life Cycle Assess 8(2):110–111
Roos P (2007) Be welcome at Springer, unit 'Environmental Sciences'. Int J Life Cycle Assess 12(7):347
Saner D, Walser T, Vadenbo CO (2012) End-of-life and waste management in life cycle assessment—Zurich, 6 December 2011. 46th LCA Swiss discussion forum. Int J Life Cycle Assess 17:504–510
Schuerch R, Kaenzig J, Jungbluth N, Nathani C (2012) 45th Discussion forum on LCA—environmentally extended input–output analysis and LCA, September 15, 2011, Berne, Switzerland. Int J Life Cycle Assess 17:840–844
SETAC—Society of Environmental Toxicology and Chemistry (1993) Guidelines for life-cycle assessment: a 'Code of Practice'. From the SETAC Workshop held at Sesimbra, Portugal, 31 March–3 April 1993. Edn. 1, Brussels and Pensacola (Florida), August 1993
Sharma V (1999) National Ecology and Environment Foundation (NEEF). Int J Life Cycle Assess 4(6):356
Sharma V (2000) Indian Society for Life Cycle Assessment (ISLCA). Int J Life Cycle Assess 5(1):4
Siegenthaler CP, Margni M (2005) Dissemination, application and assessment of LCA in industry. 25th LCA discussion forum at ETH Zürich, Switzerland. Int J Life Cycle Assess 10(5):377–378
Singhofen A, Hemming CR, Weidema BP, Grisel L, Bretz R, De Smet B, Russell D (1996) Life cycle inventory data—development of a common format. Int J Life Cycle Assess 1(3):171–178
Sonnemann G (2005) International conference on life cycle assessment 2005 (ICLCA 2005). Int J Life Cycle Assess 10(2):163
Sonnemann G, Valdvia S (2007) First phase 2 activities of the UNEP/SETAC Life Cycle Initiative (2007–2010). Second edition of the LCA award for non-OECD countries. Jim Fava, Ana Quiros, Gregory Norris, Sonia Valdivia, Guido Sonnemann and Bas de Leeuw. Int J Life Cycle Assess 12(7):544–545
Sonnemann G, Solgaard A, Saur K, Jensen AA (2001) Life cycle management—UNEP-workshop. Sharing experiences on LCM. Int J Life Cycle Assess 6(6):325–333
Sonnemann G, Vigon B, Broadbent C, Curran MA, Finkbeiner M, Frischknecht R, Inaba A, Schanssema A, Stevenson M, Lie Ugaya CM, Wang H, Wolf M-A, Valdivia S (2011) Process on 'global guidance for LCA databases'. Int J Life Cycle Assess 16(1):95–97
Swarr TE (2006) Life cycle management and life cycle thinking—putting a price on sustainability (editorial). Int J Life Cycle Assess 11(4):217–218
Swarr TE, Hunkeler D, Klöpffer W, Pesonen HL, Ciroth A, Brent AC, Pagan R (2011) Environmental life-cycle costing—a code of practice (editorial). Int J Life Cycle Assess 16:389–391
Tak H (1999) Activities of the Korean society for life cycle assessment. Int J Life Cycle Assess 4(5):247–248
Tak H (2000) Korean society for life cycle assessment. Int J Life Cycle Assess 5(1):3
Tak H (2003) Advances of LCA activities in Korea. Int J Life Cycle Assess 8(2):63
Udo deHHA, Wrisberg N (1997a) LCA strategies—LCANET. European network for strategic life-cycle assessment research and development. Int J Life Cycle Assess 2(3):124
Udo deHHA, Wrisberg N (eds) (1997b) Life cycle assessment—state of the art and research priorities. Results of LCANET, a concerted action in the environment and climate programme (DGXII). LCA Documents vol 1. Eco-Informa Press, Bayreuth, Germany and ecomed publishers, Landsberg, Germany. ISBN 3-928379-53–4
Valdivia S, Ugaya CML, Hildenbrand J, Traverso M, Mazijn B, Sonnemann G (2012) A UNEP/SETAC approach towards a life cycle sustainability assessment—our contribution to Rio + 20. Int J Life Cycle Assess. doi 10.1007/s11367-012-0529-1
Verger G (1997) First LCA workshop in Spain 'LCA 2000'—preliminary results. Int J Life Cycle Assess 2(4):250

Verghese KL, Horne R, Carre A (2010) PIQET: the design and development of an online 'streamlined' LCA tool for sustainable packaging design decision support. Int J Life Cycle Assess 15:608–620

Wrisberg N (1998) LCA tools for decision support—Chainet. European network on chain analysis for environmental decision support. Int J Life Cycle Assess 3(2):79

Wrisberg N, Udo de Haes HA, Clift R, Frischknecht R, Grisel L, Hofstetter E, Jensen AA, Lindfors LG, Schmidt-Bleek E, Stiller H (1997) LCANET—European network for strategic life-cycle assessment research and development. A strategic research programme for life cycle assessment. Final document for the concerted action LCANET. Int J Life Cycle Assess 2(2):71–72

Ximenes FA, Grant T (2013) Quantifying the greenhouse benefits of the use of wood products in two popular house designs in Sydney, Australia. Int J Life Cycle Assess 18:891–908

Yano M, Aoki R, Nakahara Y, Itsubo N, Ohta T (2000) Current activities of the national LCA project in Japan. Int J Life Cycle Assess 5(5):261–264

Zamagni A (2012) Life cycle sustainability assessment (editorial). Int J Life Cycle Assess 17(4):373–376

Zamagni A, Amerighi O, Buttol P (2011) Strengths or bias in social LCA? (editorial). Int J Life Cycle Assess 16:596–598

Zamagni A, Pesonen H-L, Swarr T (2013) From LCA to Life Cycle Sustainability Assessment: concept, practice and future directions. Int J Life Cycle Assess 18(9):1637–1641