

# International Journal of Life Cycle Assessment

## Special Issue Calendar



### Forthcoming Special Issues

2020

#### **Bio-economy and Circular Bio-economy: The role of Life Cycle Assessment and Life Cycle-based Sustainability Assessments**

*Guest editors: Meisam Tabatabaei, Yi Yang, Abdul-Sattar Nizami, Mortaza Aghbashlo, Hongbin Liu, Benyamin Khoshnevisan*

A transition towards a circular bio-economy necessitates coupling the traditional approaches to circular economy and bio-economy. This special issue aims to fill the gap in the scientific literature concerning this crucial area as much as possible, to highlight its importance and provide a platform for dissemination of the state-of-the-art advances in this field. Although different special issues have already been organized to cover bio-economy and circular economy, their main focus was put on the techno-economic aspects while ignoring integrated assessments to evaluate the interactions between the considered systems and ecosphere. It is envisioned that this Special Issue will be a key reference for engineers, scientists, industrialists and policy-makers when shaping a future sustainable bio-economy. The scope of this Special Issue includes research on development of sustainable resources and technologies on a bio-economy/circular bio-economy context with the main focus on LCA, LCSA, and exergetic LCA. “Macro Research Areas” and related “Topics” that can be potentially addressed by authors contributing to the special issue of the International Journal of Life Cycle Assessment are listed below:

- 1- Sustainable resources and technologies
- 2- Biomass processing technologies
- 3- Transition to bio-economy
- 4- Food and feed, bio-based products and biofuel/energy
- 5- Supply chain modelling and optimization
- 6- Decision support systems for sustainability assessment
- 7- Biorefinery
- 8- Nutrient recovery from waste streams
- 9- Biowaste valorization
- 10- Waste management in a bio-economy concept

2020

#### **Sustainability Issues of Food Processing and Packaging: The Role of Life Cycle Assessment**

*Guest editors: Carlo Ingrao, Amin Nikkhah, Jo Dewulf, Kurt A. Rosentrater, Valentina Siracusa, Sami Ghnimi*

Life Cycle Assessment (LCA) and – more holistically speaking – Life Cycle Sustainability Assessment (LCSA) are well established for evaluation of the environmental and socio-economic impacts

associated with lots of different sectors, including that of the food processing and packaging. Over the years, they have been documented to be very powerful tools to address trade-offs, both between life cycle stages and between different sustainability pillars.

Over the years, several papers have been published in the International Journal of Life Cycle Assessment to investigate sustainability of food processing and packaging systems, so proving the interest and attention of the Journal towards such themes. This special issue aims to further their understanding and deepening with special regard to product and process innovation, through expanded capability and greater ranges of the scenarios and systems analyzed. It was designed to motivate prominent researchers to address issues of novelty and scientific relevance in the assessment and improvement of sustainability in the food production and packaging sector.

Their studies should be developed with the aim of achieving one - or all - of the following goals:

- investigating sustainability of food processing and packaging systems, with special attention to product and/or process innovation, as well as to food waste prevention and recovery in a circular economy perspective.
- proposing integrated and generic frameworks for food process eco-design, optimizing the evaluation of sustainability criteria of new alternative food production technologies at the earlier stages of design; and/or

improving the currently available methodologies – or developing entirely new ones – to assess the sustainability rates associated with food processing and packaging systems.

In this way, the special issue will serve as a platform for exchanging knowledge on emerging methods and technologies, practical implementations, state-of-the-art analyses, findings and lessons learned in this area of research.

2019

### **Challenges toward Sustainable Food Consumption and Production**

*Guest editors: Shabbir H. Gheewala, Niels Jungbluth, Bruno Notarnicola, Brad Ridoutt, Hayo van der Werf*

Sustainable food consumption and production is a very important part of the U.N. Sustainable Development Goals. LCA as an assessment tool is very well-suited to help towards this. The scope of food LCA studies covers not only the processing stage but also upstream (i.e. raw material production – agriculture, livestock, fisheries and aquaculture & packaging production) and downstream (i.e. distribution, consumption and waste disposal) activities including related transport in all stages. The life cycle impact assessment results covering multiple impacts in quantitative terms facilitate the identification of hot spots (i.e. the main life cycle stage and activities causing significant impacts) to derive the strategies for life cycle management to improve the environmental performance of product and promote the shift towards sustainable agriculture and food production systems including more sustainable food consumption patterns via environmental certification and labelling schemes.

Various themes included here are *inter alia*:

LCA METHODS: LCA methodology, food databases, soil and land use, water footprint, biodiversity

FROM FARM TO TABLE: Crops, dairy and meat production, seafood and aquaculture, sustainable food systems, LCA case studies

FOOD SECURITY: Agricultural economics, social performance assessment, life cycle-based tools for agri-food products, sustainability assessment, climate change adaptation and mitigation

WAYS TOWARDS SDGs: Consumer information (EPD/PEF/Footprints), food loss and waste, food policy innovations, food-water-energy nexus, bio-economy

2019

## **Interpretation of LCA studies for decision support: state of the art and way forward**

*Guest editors: Serenella Sala, Alexis Laurent, Marisa Vieira, Gert Van Hoof*

Life cycle interpretation is one of the four phases identified in the ISO 14040 and the ISO 14044 standards (ISO 2006a,b). The interpretation phase requires a critical assessment of the result of an LCA study, encompassing Life Cycle Inventory (LCI) and Life Cycle Impact Assessment (LCIA) phases according to the goal and scope of the study. ISO 14044 further specifies that interpretation comprises the following elements: i) the identification of the significant issues based on the results of the LCI and LCIA phases of LCA; ii) an evaluation that considers completeness, sensitivity and consistency checks; iii) the provision of conclusions, limitations, and recommendations.

Notwithstanding that several methodological guidance exist on the different steps of LCA, the interpretation phase, so far, has been little systematized. This is visible in several scientific articles, where LCA practitioners for example formulate conclusions and recommendations with disregard of the uncertainties and the lack of consistency underlying within the LCIA steps and across the goal and scope definition or the LCI phases. The lack of comprehensive guidance for the interpretation phase is alarming as LCA is being increasingly recognised by various stakeholders. Companies are increasingly applying LCA more strategically to identify sustainability improvements ranging from single case studies to product portfolio decisions. Moreover, LCA is also recognised as reference methodology for decision support in the policy context. For example, in the EU context, these recent trends are reflected through initiatives and pilots related to the European Environmental Footprint (EC, 2013) as well as the new inclusion of LCA among the methods in the EU Better Regulation toolbox (EC, 2015), which identified tools relevant for impact assessment of policies. In this setting, robust and sound interpretation of LCA results is a must.

The aim of this special volume is, therefore, to illustrate the state of the art on the interpretation phase in LCA, while providing a showcase of methods and approaches that may help critically assess LCA results, ensuring a reliable decision- and policy-making support.

2019

## **The Future of Ecolabels**

*Guest editors: Fabio Iraldo, Rainer Grießhammer, Walter Kahlenborn*

One of the relevant market failures that may limit consumers' choice in favour of green products is represented by the so-called 'information asymmetries' in transactions, in different phases of the value chain, when economic agents do not have information about the environmental benefits enabled by their purchasing decisions. In particular, if it is costly and time consuming for consumers to acquire that information, this asymmetry may lead to greener products not being purchased on the market. This problem is especially caused by misleading claims on environmental performance of products on the final market, which clearly prevents consumers from fully deploying their potential in terms of green product demand.

Ecolabels, as voluntary environmental and consumer policy instrument, are conceived to overcome this problem and they build an integral part of the European framework on Sustainable Consumption and Production (SCP). They interact with and complement other instruments, such as energy labelling, ecodesign and green public procurement by setting high environmental standards to encourage the market to develop more sustainable products. The Global Ecolabelling Network (GEN), which is an association of leading ecolabelling organizations worldwide, boosts 31 member organizations in 51 territories and countries with more than 300,000 certified products worldwide. However, ecolabels have been facing severe challenges in implementing high sustainability standards in the globalized and widely ramified value chains. As the products are seldom produced solely for national markets and the

industry requires internationally harmonized standards to promote trade and commerce, there is an imminent need of strengthening the cooperation among ecolabels worldwide. Apart from a coherent international positioning of ecolabels and undertaking Mutual Recognition Agreements, it is important that ecolabels address the global challenges together by developing common criteria as well as mutual verification and certification mechanisms.

2018

### **New Paradigm in Urban Development: Life Cycle Thinking and Sustainability**

*Guest editors: Giuseppe Ioppolo, Marzia Traverso, Matthias Finkbeiner*

Today, for the first time in history, more than a half of the world population is living in urban areas (54%), accounting for about 3.5 billion people. This urban percentage will increase to almost 66% by 2050, with nearly 90% of the increase concentrated in Asia and Africa (ESA-UN 2014). The number of mega-cities has nearly tripled since 1990; and by 2030, 41 urban agglomerations are projected to house at least 10 million inhabitants each (ESA-UN 2014). By 2020, approximately 73% of Europeans will be living in urban areas, characterized by medium-size cities (1-5 millions of inhabitants) and by four big cities (Berlin, London, Moscow, Paris) and one big urban area (the metropolitan area Rhine-Ruhr in Germany).

A new perspective in urban development is that urban planning and city management will have to include sustainability solutions in the design of cities (shape and dimension), in a rather different way compared to traditional urban management practices (Jones et al. 2002).

Industrial Ecology and life cycle thinking can offer comprehensive methodologies and very powerful approaches to design new paradigm of sustainability in this field.

The special issue moves from theory and tools to policy and aims to handle how to outline a route for sustainable and shared urban planning development (in a triple bottom line sustainability perspective).

As an emerging field tools for accounting and defining measures and thresholds of sustainability in urban context are needed. Life Cycle Assessment (LCA) is often used in a hybrid way together with Risk Assessment (RA), Cost Benefit Analysis (CBA) and Multi-Criteria Decision Analysis (MCDA) (Jeswani et al. 2010), or for instance in the LCA-SEA (LCA-Strategic Environmental Assessment case (Nilsson et al. 2005; Börjeson et al. 2006; de Ridder et al. 2007; Höjer et al. 2008; De Benedetto and Klemes 2009; Finnveden 2009; Heijungs et al. 2010; Björklund 2012).

The main goal of this special issue is to define the current state of the art of life cycle based sustainability applications, methodologies and tools as well as their implementation in an urban context as decision support for policy makers, companies and other stakeholders.

We call for papers covering several aspects of sustainability combined with life cycle thinking in urban development scenarios: scientific background (ontology, epistemology), methods and models (inventory and pathways), tools, data, case studies.

2018

### **Challenges and Best Practice in LCAs of Seafood and Other Aquatic Products**

*Guest editors: Ian Vázquez-Rowe, Friederike Ziegler, Angel Avadí, Patrik Henriksson*

Given the increasing global demand for fish products both for direct human consumption and animal feed for agri- and aquaculture, alongside the fact that fishery catches have stagnated, it is relevant to study the environmental and ecological impacts associated with current seafood supply chains in order to optimise future ones. Globally, more than half of the seafood is produced in aquaculture, a proportion that will continue to increase as it is expected to become the main sector to meet the growing seafood demand. Seafood products often originate in diverse supply chains involving actors such as capture fisheries, feed producers, aquaculture farms, seafood processing plants, wholesalers, retailers and consumers around the world. Each actor contributes to the overall environmental profile

of the products resulting in specific improvement options.

To quantify environmental impacts throughout product supply chains, LCA has been applied to seafood production systems over the past 15 years, and the body of scientific literature is growing rapidly. Although substantial methodological improvements have been achieved over the years, certain challenges remain. To avoid these constraints, we would like to point out a number of remaining issues that if addressed would improve the utility of seafood LCA studies greatly:

- Address in full all requirements for goal and scope in ISO 14044, including justifying specific methodological choices such as system boundaries, functional unit, co-product allocation strategy, choice of impact assessment methods, inclusion or exclusion of infrastructure and other capital goods;
- Contrast allocation strategies (see bullet point on uncertainty);
- Present data that enables reproducibility of results, namely inventories, data sources, assumptions, choices, including their justification (either in the study or as supplementary online files);
- Perform statistical treatment of data, when multiple samples (vessels, farms, plants) are considered (and when not, discuss representativity of the results);
- Conduct sensitivity and uncertainty analyses, and discuss various sources of uncertainty in the aggregate LCA model and how it may influence results and conclusions (where a sensitivity analysis should be conducted for allocation, as prescribed by ISO 14044);
- Ensure that any comparisons of results with those of other studies are done in a meaningful way (e.g. considering study design differences);
- Describe in detail the modelling of recycling activities;
- Assess relevant biological impacts such as sustainable use of fish stocks when studying capture fisheries and seafloor impacts when the fishing gear used has seafloor contact.
- Explore the potential role of LCA in seafood certification schemes.

2018

### **Social LCA in Progress**

*Guest editors: Alessandra Zamagni, Marzia Traverso, Catherine Macombe*

Several efforts have been made in the last 10 years to improve and further implement social life cycle assessment (S-LCA) methodology, which, among the three life cycle techniques, is the least developed and not standardized yet (UNEP/SETAC 2013, UNEP/SETAC 2009). Developments occurred in many directions, ranging from aggregation methods for social indicators, definition of system boundaries, data collection and building up of S-LCA databases, just to name a few. In parallel with the methodological developments, industries and private organizations started applying S-LCA and developed it further by tailoring the method to the specific needs of the sector of interest. However, for confidentiality reasons, these applications are not publicly available yet. And also because S-LCA results are difficult to communicate, due to two main aspects: the method is still under development, and improvements are needed, an aspect that hampers the robustness of the results themselves; communication, if not done properly, can lead to misunderstanding by the final users/consumers.

For this reason, it is time to make a reflection about where S-LCA is going, which purposes and goals it can serve, what is currently available and how it can be used and how organizations could benefit from it. These considerations led to the development of this Special Issue titled “Social LCA in progress”, to highlight the evolutionary nature and status of S-LCA.

2018

### **Advancing Social and Economic Knowledge in Life Cycle Management**

*Guest editors: Henrikke Baumann, Mattias Lindahl, Christina Scandeliuss, Kirsten Schmidt, Guido Sonnemann*

The combination of life cycles and management enables many kinds of LCM research. Novel terminology and perspectives to LCM research introduced by the included papers convey some of this diversity. Studies with a product chain perspective to LCM offer a complementing contrast to the study of corporate LCM. Advancement of LCM research can thus be achieved by expanding from the company perspective towards, looking deeper into the interactions of multiple actors. Also, critical perspectives have been shown to be valuable for the legitimacy and credibility of LCA and its practitioners. These studies show how deeper studies in the social sciences offer paths for the further advancement of LCM.

## **Published Special Issues**

2017

### **Promoting Sustainability in Emerging Economies via Life Cycle Thinking**

*Guest Editors: Shabbir H. Gheewala, Thapat Silalertruksa, Pomthong Malakul, Trakarn Prapasongsa*

Volume 22, Issue 11, November 2017

<https://link.springer.com/journal/11367/22/11/page/1>

Emerging economies have played an important role in driving global sustainability due to their high share of the world population, production, as well as consumption. Even so, emerging markets lag behind developed countries, and all countries face common challenges including energy security, environmental protection, and affordable energy for fulfilling the rapidly growing demand for energy (IEA 2013). Despite the age of science, technology, and innovations, the current development trends in developing regions may still pose threats to the environment, human health, and natural resources. According to the latest regional assessments in global environmental outlook (UNEP 2016a, b, c), major concerns include changes in demography and lifestyle, inequality, increased resource use with decreased efficiency and productivity, increased environmentally related health risks, increased vulnerability to natural hazards and extreme events, land degradation, resource scarcity, biodiversity and habitat losses, and widened gaps between policy and implementation. In order to leapfrog these problems in developing countries and avoid the environmentally harmful stages of development, it is necessary to have measures as well as tools for supporting both policy decision makers and producers for strategic planning.

2017

### **Life Cycle Assessment: A Tool for Innovation in Latin America**

*Guest editors: Isabel Quispe, Ian Vázquez-Rowe, Ramzy Kahhat, Alejandro Pablo Arena, Nydia Suppen-Reynaga*

Volume 22, Issue 4, April 2017



<https://link.springer.com/journal/11367/22/4/page/1>

The main goal of this Special Issue is to present selected LCA studies, submitted to CILCA 2015, and related to the application of LCA in the Ibero American region as a route to achieving eco-innovation in the region.

CILCA 2015 was presented as a multidisciplinary conference in which a wide range of life cycle issues was accepted, including methodological advancements; the application of LCA in public policies; or the development of numerous case studies in diverse productive sectors, such as agriculture, building, biofuels, or wastewater treatment. However, when a look back is taken to the final disposition of oral presentations, it can be observed that the total amount was skewed considerably towards agrifood topics. This observation is in line with the fact that Latin America's agricultural production is highly dependent on the export of different types of food products. However, it is also worth noting that other primary sector activities, namely, mining or the extraction of fossil fuels, which are important within the regions' GDP, have been repeatedly absent, not only in CILCA 2015 but also in previous CILCA events. The causes that explain the uneven implementation of life cycle thinking methods through sectors in the region are somewhat heterogeneous. Nevertheless, we hypothesize that there are two main causes behind this circumstance. On the one hand, despite the efforts of UNEP and some national authorities (e.g., Chile, Mexico, or Brazil), the lack of national life cycle inventories is an endemic problem in the region, limiting the certainty of the results presented in case studies (Beltran et al. 2016). On the other hand, it seems as if important multinational companies that have developed LCA schemes within their organigrams are yet to export this expertise to their subsidiaries in Latin America.

2017

### **Assessing and Managing Life Cycles of Electric Vehicles**

*Guest editors: Alexandra Pehlken, Ming Chen, Steven B. Young*

Volume 22, Issue 1, January 2017

<https://link.springer.com/journal/11367/22/1/page/1>

Electric vehicles (EV) have made marvelous achievements in many countries all over the world. Notably, EVs have now entered a new period of rapid development and propagation. Thus, the issue of the whole life cycle of electric vehicles is manufacturing, use and end-of-life is more prominent and is creating great interest from governments and scientists alike.

A 2014 joint workshop at the Hanse-Wissenschaftskolleg (HWK) in Germany addressed the topic of electro mobility, leading to this special issue on "Electric Vehicles". Various international experts gathered in Germany and discussed challenges and drivers in electro mobility. As an outcome, the International Journal of Life Cycle Assessment offered the possibility to publish selected manuscripts in the context of LCA-related approaches towards electro mobility.

The focus of this special issue is on life cycle assessment (LCA) and life cycle management (LCM) of electric vehicles, with particular attention on issues of materials, critical resources, reuse, and recycling. The new material intensity of automobiles needs to be examined and managed using a life-cycle lens. The articles can be generally clustered into four topics:

Assessing the use phase of EVs (Moro and Helmers 2016; Helmers et al. 2016),

Resource driven assessments (Gemechu et al. 2016; Pehlken et al. 2016; Hernandez et al. 2016),

The potential of EVs for energy storage systems in the smart grid as a cascading use option (Gemechu et al. 2016; Richa et al. 2016; Casals et al. 2016), and

The assessment of fuel cell electric vehicles (Miotti et al. 2016).

2016

### **LCA of Metals and Metal Products: Theory, Method and Practice**

*Guest editors: Martin Baitz, Chris Bayliss, Andrea Russell-Vaccari*

Volume 21, Issue 11, November 2016

<https://link.springer.com/journal/11367/21/11/page/1>

This Special Issue brings together a range of papers from the metals and mining industry exploring such alignment from the perspective of specific metals. The papers are therefore necessarily varied in the issues they address (reflecting a diversity of products, environmental impacts, allocation issues, and systems) but are tied together by a commitment to a harmonized approach to LCA for metals; high quality data and analysis; alignment with international standards and a full lifecycle approach to decision making and the assessment of environmental impacts of products and processes.

In addition to the harmonization paper of Santero and Hendry (2016), this Special Issue comprises results of product LCAs: lead batteries and architectural sheeting (Davidson et al. 2016), nickel-containing stainless steel rebar (Mistry et al. 2016a) and molybdenum-bearing advanced high-strength steels in the lightweighting of vehicles (Hardwick and Outteridge 2015); cradle to gate LCIs and impact assessments for manganese (Westfall et al. 2016), primary aluminum (Nunez and Jones 2015), nickel (Mistry et al. 2016b), and zinc (Van Genderen et al. 2016); and explorations of specific indicators and issues: a perspective on LCA harmonization from the International Molybdenum Association (Greig and Carey 2015), an application of novel approaches to water scarcity footprint calculation for primary aluminum (Buxmann et al. 2016), steel recyclability (Broadbent 2016) and the influence of durability and recycling on impacts of window frames (Carlisle and Friedlander 2016).

While these published papers represent some of the most recent efforts of the sector to collect, analyze, characterize, communicate, and critique industry data, there is ongoing work to update lifecycle databases, inventories, impacts, and indicators with representative and timely data and to continue methodological harmonization efforts. It is hoped that this Special Issue is the first in a series to communicate publicly the state of the art of the theory, method, practice, and application of life cycle assessment in the metals sector.