

1st African Life Cycle Assessment Symposium

Monday, 29 August 2005, UNEP Headquarters, Nairobi, Kenya

“Towards a Critical Mass for LCA Application in Sustainable Consumption and Production in Africa”

Summary of Proceedings

compiled by
Dr. Harro von Blottnitz
University of Cape Town

Organized by
United Nations Environment Programme (UNEP)

In collaboration with
The African Roundtable on Sustainable Consumption and
Production (ARSCP)
<http://www.arscp.org>

African Life Cycle Assessment Network (ALCANET)
http://jp1.estis.net/sites/lca_africa/

Table of Contents

Introduction	3
Opening Session: Policy context, governmental perspectives and industrial use	4
Morning session: LCA applied to African power, water and mining issues	7
Afternoon session: LCA applied to African waste, oils and fuels issues	8
Closing Session: Perspectives from abroad on the How and Why.....	9
Glossary	10

Introduction

A life cycle approach identifies both opportunities and risks of a product or technology, from raw materials extraction to disposal. To do this there is a continuum of life cycle approaches from qualitative (life cycle thinking) to comprehensive quantitative approaches (life cycle assessment studies). People, companies and governments can use these various life cycle approaches in anything from making purchasing decisions, engineering a new product design, or developing a new government policy.

In 2002, UNEP joined forces with SETAC to create the Life Cycle Initiative, as a response to the call from governments for a life cycle economy in the Malmö Declaration of 2000. The initiative contributes to the 10-year framework of programmes to promote sustainable consumption and production patterns, as requested at the World Summit on Sustainable Development (WSSD) in Johannesburg (2002). The Summit also called for the development of production and consumption policies to improve the products and services provided, while reducing environmental and health impacts, using, where appropriate, science-based approaches, such as life cycle analysis (LCA).

Unlike the more developed regions of the world, Africa has so far been unable to harness the potential in LCA for sustainable development, except for a number of isolated case studies in the productive sectors to demonstrate its viability. Three key reasons account for this. First, the traditional product-service focus of LCA has evolved in a context of over-consumption, and its potential to inform and evaluate development alternatives remains under-explored. Second, LCA is a new tool to the region and the level of awareness by government and industry on its potential to support sustainable consumption and production is low. Third, capacity building institutions such as universities are not well equipped to meet training requirements.

At a time when the continent is reeling from the negative implications of unsustainable consumption and production in key sectors including industry, agriculture, water, energy and natural resource exploitation, there is an urgent need to develop a critical mass of personnel who would take lead in disseminating the LCA concept in key development sectors and programmes. NEPAD's vision of fast economic growth of 6% per annum particularly puts pressure for countries to have the manpower to orient such economic growth along sustainability paths informed by life cycle thinking. The African 10 Year Framework Programme on Sustainable Consumption and Production, which was approved by the African Ministerial Conference on Environment (AMCEN) in March 2005, recognized the need to enhance capacities on the application of LCA within the specific context and development priorities of the region. A number of proactive departments at some African universities are already putting such programmes in place, and an African LCA Network (ALCANET) has been established.

With this context in mind, a day-long Symposium was organized on 29th August 2005 to *inter alia*, encourage the exchange of experiences on the application of the LCA tool in Africa, to work towards a body of science to support its application in all three spheres of sustainable development, and to strengthen the recently founded ALCANET. It was envisaged that the academic participants would influence the integration of Life Cycle approaches in general and LCA in particular, in teaching and research programmes of their respective university divisions, whilst the NCPCs would be encouraged to train local SMEs in the tool's application. The symposium was followed by a 4-day train-the-trainers workshop.

The presentations made during the symposium were invited after a call for contributions had been issued in early 2005, distributed via the ARSCP as well as the African Association of Universities. All presentation materials have been made available on a CD issued after the symposium and workshop.

Opening Session:

The symposium was opened by Mrs. Cristina Boelcke, Director of the Division of Regional Cooperation of UNEP. In her opening address, Mrs. Boelcke noted that the Malmo Declaration that was adopted by the Global Environmental Ministers Forum in 2000 underlined the need for promoting a life cycle economy that reduces the adverse impact on the environment while promoting the fulfilment of economic needs. The UNEP-SETAC Life Cycle Initiative was launched in 2002 in response to this call and with a mission of developing and disseminating practical tools for evaluating the opportunities, risks and trade-offs associated with products and services over their entire life cycle to achieve sustainable development. She underlined that the organization of this workshop is aimed at responding to the region-specific needs in the context of the global recognition given to the promotion of life cycle economy and UNEP's capacity building and technology support described earlier.

Earlier, Dr. Patrick Mwesigye, President of the African Roundtable on Sustainable Consumption and Production (ARSCP), welcomed the participants on behalf of ARSCP and its partners. He indicated the symposium and workshop were organized as part of the implementation of the African 10 Year Framework Programme and expressed his hope that it will lay down the basis for other follow-up activities in the area. He noted that, besides providing the technical knowledge, the workshop would provide a useful platform to strengthen the partnership between National Cleaner Production Centers (NCPCs) and universities in their respective countries. Dr. Mwesigye concluded his welcoming remark by expressing his appreciation for the financial and institutional support provided by UNEP towards organizing the symposium and workshop.

At the end of the opening session, Dr. Desta Mebratu, Industry Affairs Officer at UNEP's Regional Office for Africa, expressed his appreciation for the contribution that had been made by members of the technical team towards the organization of the Symposium and Workshop. He particularly recognized the significant contribution that had been made by Dr. Toolseeram Ramjeawon from the University of Mauritius, Dr. Harro von Blottnitz from University of Cape Town, Dr. Greg Norris from Harvard School of Public Health and Mr. Tim Grant from Royal Melbourne Institute of Technology.

Session 1: Policy context, governmental perspectives and industrial use

Presentations:

The first session was facilitated by Professor Cleo Migiro, Secretary of ARSCP. Three presentations were made under this session. The first presentation was made by Dr. Desta Mebratu, UNEP Regional Office Africa, under the title Sustainable Consumption and Production (SCP) and the African 10 Year Framework Programme. In his presentation, Dr. Mebratu highlighted the process that led to the African 10 Year Framework Programme on Sustainable Consumption and Production which was approved by AMCEN in March 2005. He noted that the four thematic areas identified in the programme have direct linkages with the on-going regional effort to meet basic needs and he stressed enhancing regional capacities on utilization of tools such as LCA is essential to promote sustainable development and enhance the contribution of the region towards the promotion of sustainable consumption and production.

The second presentation was made by Dr Tony Leske, Manager - Environmental Research at Sappi Technology Centre, under the title 'The Application of Life Cycle Assessment in Sappi South Africa'. In his presentation, Dr. Leske highlighted the key approaches followed in utilizing LCA methodologies within the industry sector, particularly in the development of Integrated Environmental Management Plans (IEMPs). He concluded his presentation by highlighting the key challenges that industries are facing in the application of LCA, which include: obtaining acceptance by all relevant environmental authorities for the proposed approach, and particularly the use of LCA, capacity within the regulatory authorities to understand and accept the LCA methodology, and the availability of country specific normalization factors.

The third presentation was a summary input from Dr. Peter Acquah, Secretary of AMCEN Secretariat, and Dr. Desta Mebratu on the discussion and position taken on LCA application by government representatives during the approval of the African 10 Year Framework programme. They noted that, while the importance of promoting the application of LCA was recognized and approved by AMCEN, the South African Government representatives were concerned about the way LCA is being used by different groups and cautioned to avoid situations which could be detrimental to the region's economies. It was agreed that such a concern is understandable in view of the nature of the region's economy which is largely based on extraction of natural resources and which makes the application of LCA more complex. Both speakers underlined the importance of enhancing capacities for LCA application within the Region so that countries would be in a position to avoid the undue application of LCA while at the same time make use of it to promote sustainable development in the region.

Discussion:

Questions concentrated on the policy context in which LCA would have to be developed in Africa, on matters of communication between experts and politicians, and on issues of capacity development.

Policy context:

- 1) Q: Are the right political drivers in place? Or would political buy-in to the use of LCA in decision-making need pressure from (yet to emerge) green parties? A: Such parties might have a role to play, but the technical community must leave this to the political process in individual countries. Commitments by governments of the day to sustainable development, such as the AMCEN ministerial endorsement of the 10 yr FP, are what is needed to provide the policy context.
- 2) Q: Are development failures more traceable to internal or to external problems, and what does this imply for new initiatives like the 10 yr FP on SCP? A: "We"

(African politicians, thinkers, NGOs, civil society) must take responsibility and not defer all problems on external causes.

- 3) Q: How does the 10 yr FP (and thus the life cycle economy) fit in with issues of poverty and unsustainable livelihoods. A: Not answered directly.

Communication:

- 1) Q: Politicians have short spans in office: how will continuity in policy and implementation be achieved? A: Technical meetings are a good tradition, and these must continue to seek common platforms with policy-makers. This will also require that technical people learn to explain SCP and LCE matters in common terms.

Capacity building for LCA:

- 1) Q: What capacity is being built to enable the use of LCA in generating and evaluating development alternatives? A: It is not so much about creating new institutions, but about bringing existing ones together, then adding the missing capacity in. The ARSCP and ALCAnet have roles to play in this regard, as do of course the relevant government departments.
- 2) Q: When firms commission data gathering for LCA's, how much work do they give to local/African laboratories? A: Industry uses local laboratories and expertise when it can, and will support local developments.
- 3) Q: How will African-specific LCA knowledge be built up, e.g. in the form of normalization factors? A: Meetings such as this one (and the Round Tables), and the actions flowing from them, should be addressing these matters. African LCA practitioners will have to develop their own LCA terminology and discourse.

Synthesis

Participants left this session with a clear understanding how this 1-day symposium on LCA and the ensuing 4-day training workshop are conceived to fit into the current African policy context on SCP. Challenges lying ahead in making LCA useful to the needs of policy-makers were also identified. The scene was thus set for participants to take in some impressions on how LCA is currently used in African settings, and what questions researchers are contending with.

Session two: LCA applied to African power, water and mining issues

Presentations:

Life Cycle Assessment of Electricity Generation from Sugar-Cane Biomass

Dr Toolseeram Ramjeawon, University of Mauritius, presented the approach to, and the results obtained for generating a life cycle inventory of electricity as generated from bagasse in Mauritius.

Life Cycle Assessment in the Water Industry: A South African Perspective

Elena Friedrich and Chris Buckley, University of kwaZulu-Natal. These colleagues have for several years investigated the environmental dimension of the provision of water and sanitation in their city using LCA, and presented the approach and results.

Use of Life Cycle Assessment to Provide a Guide for Reducing the Environmental Footprint of South African Mining Products

Neil Robinson and Harro von Blottnitz, University of Cape Town. The presentation described an ongoing research project towards a Masters dissertation, describing work done in order to create a gate-to-gate Life Cycle Inventory for a gold producer.

Discussions:

Several of the questions to the three presenters were aimed at clarifying matters raised in the presentations, and these are not summarized here. Some questions were aimed at drawing more general lessons from these three cases, e.g. for transfer to other countries. These latter group included:

- 1) Q: Are environmental effects from the decommissioning of a facility included in LCA. A: They may be, but generally are small in comparison to those in the operating phase, so can be left out for first and second order LCAs.
- 2) Q: How can other countries benefit from the presented LCA research: A: Data and results can be shared. Also, general lessons, such as the dominance of electricity related impacts in water infrastructure LCAs can be directly transferred. But, one must be careful about using good data in a different context, where it may not be representative.
- 3) Q: Can LCA include social effects, such as in the LCA on water treatment, where a dam was built with significant relocation of people? A: Whilst info on such effects may be available, one has to look how useful it is in providing those answers that the LCA is set out to provide.
- 4) When a facility produces several products (sugar, molasses and electricity in the Mauritian case; gold and silver in the South African mining case), how are environmental burdens allocated? A: This is an important methodological issue in LCA. For South African gold, silver is a minor byproduct and can be ignored. For Mauritian bagasse-based electricity, environmental burdens must be allocated between the three products. The allocation rule chosen reflects Mauritian practice.

Synthesis

This session provided first examples of current African LCA research, covering three important sectors: energy, water and sanitation, and primary production (mining and extraction). The usefulness of such LCA work for policy input, and for improving industrial practice, emerged. Several methodological questions were raised, but possibly remained unclear. It was the intent of the training workshop later in the week to resolve such questions.

Session three: LCA applied to African waste, oils and fuels issues

Presentations:

LCA of Windrow and Aerated Static Pile composting in the African context with Mauritius as case study

Dr Romeela Mohee, University of Mauritius, presented her work to optimize, from an environmental perspective, solid waste management practices in Mauritius. She demonstrated how LCA can give some clear answers as to which practices are preferable.

Potential Application of Life Cycle Management Approach in Waste Oil Management in Nairobi

Evans Kituyi, University of Nairobi, discussed the problem of waste vegetable oil in Nairobi, and attempted to distinguish how an LCA can add further value to an SCP approach.

A Life-Cycle Comparison between Processes using either Inorganic or Biological Catalysis for the Production of Biodiesel

K.G. Harding^{1*}, S.T.L. Harrison¹, H. von Blottnitz¹, and J.S. Dennis², University of Cape Town (1) and University of Cambridge (2). This presentation showed how LCA is being applied in research towards a PhD, aiming to use it to uncover environmental advantages in bioprocessing technology. It focused on two alternative routes to biodiesel, showing how reduced utility needs translate into life cycle environmental advantages.

Discussions:

The discussion following these presentations indicated that participants were familiar with the problems, and that the application of LCA was providing a new lens through which to look at them. Questions raised were:

- 1) Q: In the Mauritian example, is waste separated prior to composting, and what was assumed about non-compostables? A: For the modeling, the organic fraction only was considered. In practice this would necessitate source separation or a material recovery facility prior to composting.
- 2) Q: In relation to the management of used lubricating oils, what is the difference between a Life Cycle Management approach and a Cleaner Production approach? A: In an LCM approach, the oil companies who produced and marketed the lubricating oils would need to take an involvement, whilst the tools of Cleaner Production approaches can be applied regardless of that commitment - though possibly with less reach? Also, with fuel prices being high, used lubes are having many possible further lives - a life cycle approach thus makes sense.
- 3) Q: Also in relation to the management of used lubricating oils, would it be conceivable to learn from the South African example of the ROSE Foundation? A: The speaker thought it would be difficult to convince or compel suppliers to engage with this. But there was a feeling expressed around the room that it might be worthwhile to pursue this line.
- 4) Q: In the LCA on biodiesel production, what were the sources of methanol and ethanol assumed to be? A: Ethanol was assumed to be manufactured from sugarcane molasses according to recent South African practice.

Synthesis

This session provided further examples of current African LCA research, covering the important sectors of waste management and biomass utilization. Questions asked during the discussion indicated that participants were familiar with these problem sets, and impressed by the value that life cycle approaches could bring to aid with optimizing solutions. Whilst the first study presented contained both relevance to African experiences and applicability of the life cycle approach, the 2nd paper could not fully convey the relevance of LCM, and the 3rd did not present usefulness to Africa beyond usefulness globally - although it built at least in part on previous African LCA work.

Session four: Perspectives from abroad on the How and Why

Presentations:

The Practice of Life Cycle Inventory: Introduction and Experiences from the European Corrugated Board Industry

Angeline de Beaufort, Consultant Environmental Affairs for European Paper and Corrugated Board Industry, described the history of usage of LCA in this industrial sector, and outlined how the LCA practitioner can add value to environmental management.

Linking Methods and Theory with Practice for Learning Cycles of LCA

Gregory A. Norris, Harvard School of Public Health, presented a his theory of how LCA should be used to drive purchasing decisions that favor investments resulting in poverty alleviation and thus massive reductions in lost life years. Interestingly, the data gathering for such a use of LCA could be constructed to happen in such a way as to empower local communities beyond the value which the investments would themselves bring, by learning and carrying out the necessary research, then recording it for data harvesting on the web.

Discussions:

- 1) Q: How did you overcome the confidentiality concerns from the industry? A: Fortunately the study followed after a number of regulatory laws had been promulgated which in essence, forced the industry to be transparent about their environmental performance. The industry was therefore keen to know where they stand too.
- 2) Could you share your experience on how best to approach a life cycle inventory exercise for a particular industry? A: The best way is to start on a gate-gate study of your industry since you know it best, for other related industries add these on starting with what is published/been done by experts in those industries.

Comment: Angeline offered a number of relevant publications from SETAC. A SETAC Europe website may be consulted for copies.

Synthesis

This session provided two very useful insights: The first one related to current, commercial practice where data for LCA are regularly collated, managed, updated and made available to stakeholders who need them in decision-making. The second insight gained was that novel ways of using LCA are being discussed in academia, and that one such approach may provide a very powerful to unlock pathways to better health and quality of life in developing countries. This will, however, need much more work so that information on hundreds of thousands of supply chains can eventually be gathered - not just for the results to be used in product purchasing decisions, but also in an empowering process.

Glossary

10 yr FP: 10 year framework plan (on SCP)

LCE: Life Cycle Economy as called for in the Malmö declaration.

SCP: Sustainable Consumption and Production