

Development of National LCA Database Roadmaps, including further development of the Technical Helpdesk for National LCA Databases

Deliverable D 2.3 - Report on baseline assessment and stakeholder mapping in South Africa

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Life cycle assessment (LCA) in South Africa

Introduction and background

Life cycle assessment studies first surfaced in South Africa in the mid to late nineties, with a few MSc and PhD studies, predominantly at the University of Cape Town (UCT), University of KwaZulu Natal (UKZN) and University of Pretoria (UP). Over the subsequent two decades, LCA application has spread to all other major South Africa's universities and technical colleges, and at the same time been taken up in business, both by corporations and industry associations, working with local and international service providers. Industry sectors active in LCA span retail, fast-moving consumer goods, manufacturing and mining. The early application of LCA in South Africa is well covered in an article by Brent et al. (2002), which provides the status of LCA in South Africa at the time of the 2002 World Summit in Johannesburg.

First applications of LCA in South Africa by industry were through multi-nationals operating in South Africa commissioning LCA studies on their South African products, and by global industry association data collection projects, specifically reaching South African mining companies. Carbon footprinting and water footprinting have also become increasingly popular with industry, especially within mining and agriculture, allowing a number of private consultancies to develop in this area over the past 10 to 15 years.

Application in the public sector remains the least active area of LCA in South Africa. Those studies involving the public sector that have been undertaken have tended to be in partnership with academia. Nonetheless, increasing awareness of life cycle thinking (LCT) and LCA is evident in industry and government, due in part to a number of significant capacity building and awareness raising events over the past few years. A poster presented at LCM 2015 by Harding et al. summarises the current status and prospects of LCA in South Africa¹ (Harding et al., 2015).

Significant events and the increasing momentum of recent years are illustrated in the timeline in Figure 1.

¹ A journal article on the status of LCA in South Africa is currently under preparation.

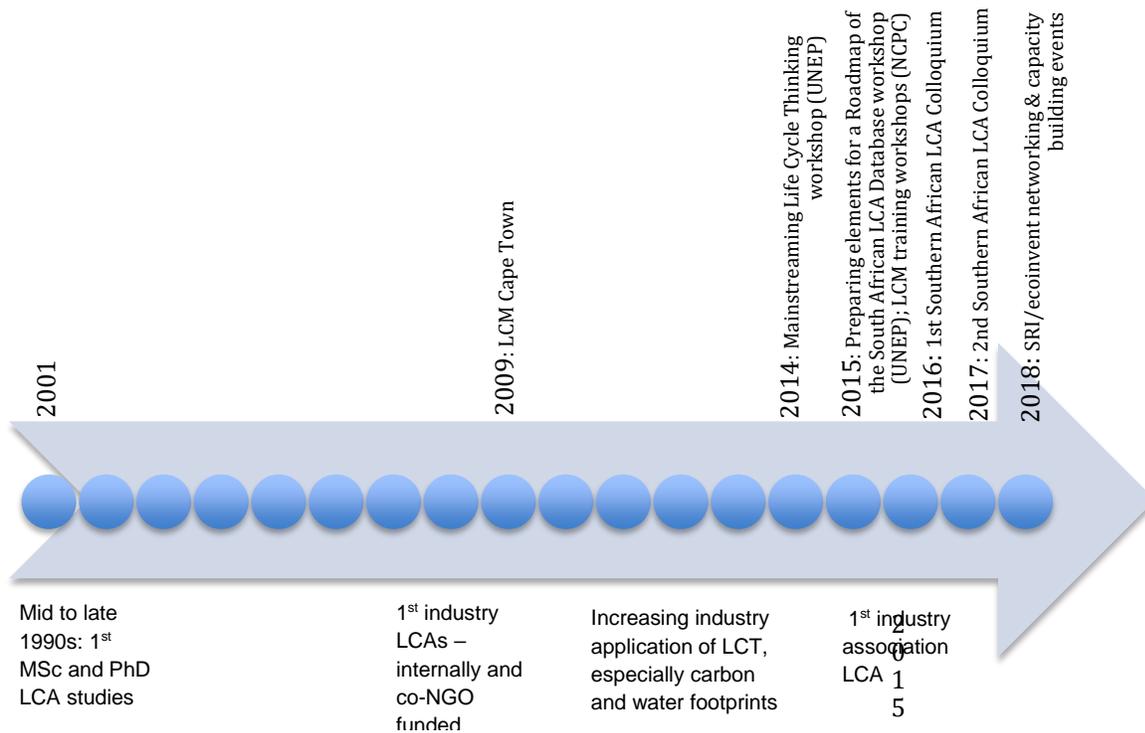


Figure 1: Timeline of LCA events and development in South Africa

LCA in industry and the private sector

Application of LCA in industry in South Africa is either through partnership with academia or commissioning a consultancy, with little to no in-house LCA capacity in industry in South Africa. Funding and motivation for such industry studies is often not from within industry itself, with donor funders, development agencies and NGOs playing an important role here, as can be seen from the projects listed in Table 1.

The National Cleaner Production Centre South Africa (NCPC-SA) is a government programme, reporting to the Department of Trade and Industry (the dti), with the aim of driving South African industry towards a low carbon economy through appropriate resource efficiency and cleaner production interventions. Three special projects run by NCPC-SA have involved promoting life cycle thinking (LCT)/ life cycle management (LCM) in South African industry:

- Life Cycle Management and waterfootprinting, undertaken in partnership with UNEP;
- Eco-innovation Programme, undertaken in partnership with UNEP and Stellenbosch University to advance the adoption by South African industry of alternative systems and processes of manufacturing;
- SWITCH Africa Green,² undertaken in partnership with the Department of Environmental Affairs and UNEP to facilitate the process of helping SMMEs adopt sustainable business practices and climate mitigation and adaptation business practices.

A pilot of the Life Cycle Management Capability Maturity Model (LCM-CMM) project (a United Nations Environment Programme initiative) involving a local textile company (Freudenberg Nonwovens) resulted in three further NCPC-initiated life cycle projects in South African companies (see Table 1).

The Clay Brick LCA represented a first in South Africa of an industry association undertaking an LCA. This project was a collaboration between the Clay Brick Association (representing the brick makers that participated in the study), academia and consultants, with additional funding and support from the Swiss Agency for Development and Cooperation (SDC). The LCA was undertaken by the University of Pretoria, with a review and summary completed by Quantis with the summary funded by the Energy Efficient Clay Brick (EECB) project, implemented in South Africa by Swisscontact and funded by the SDC. A Social LCA was also undertaken by Equispectives Research and Consulting Services. Interpretive brochures were developed by The Green House.

² www.switchafricagreen.org/

Table 1: Industry application of LCA in South Africa

| Partner Type | Company/Industry | Developer |
|-----------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Academic | Anglo American Platinum | University of Johannesburg |
| | AngloGold Ashanti | University of Johannesburg |
| | South African Pork Producers Organisation | Stellenbosch University |
| | South African Sugarcane Research | University of Pretoria |
| Donor funder | ASPEN Nutritionals | NCPC-SA/ consultant |
| | Belgotex | NCPC-SA/ consultant |
| | Freudenberg Nonwovens | NCPC-SA/ CADIS and ZZwavel Consulting |
| | Van Dyck Carpets | NCPC-SA/ consultant |
| | Road infrastructure | TradeMark SA /The Green House |
| NGO | Sugar Association of South Africa | WWF-SA / The Green House |
| | Woolworths (Textiles) | WWF-SA / The Green House |
| | Woolworths and their major suppliers (Milk) | WWF-SA / The Green House |
| | Woolworths and their major suppliers (Beef) | WWF-SA / The Green House |
| Internal | Tetra Pak | The Green House |
| | Tiger Brands | PE International |
| | Unilever | The Green House |
| | Nestle | Quantis |
| Public (IDC) | Southern African Sustainable Textiles and Apparel Cluster (Cotton textiles) | The Green House |
| Industry association | Clay Brick Association | University of Pretoria (review and subsequent work by Quantis and The Green House); Equispectives Research and Consulting Services (social LCA); Energy Efficient Clay Brick Project (SwissContact) |
| | International Platinum Association | thinkstep |

LCA in regulations and public policy

South Africa's National Environmental Management Waste Act (2008) includes the prescription that the Minister of Environment (in consultation with the Minister of Trade and Industry) may require that the producer of a product or class of products must carry out a life cycle

assessment in relation to the product. This notice falls under the Extended Producer Responsibility (EPR) clause of the Waste Act, and could potentially apply to any product or class of products identified to which EPR applies. Sectors currently required by the Minister to submit Industry waste management plans (IndWMPs) include the paper and packaging industry, the electrical and electronic industry and the lighting industry. To date, none of these industries have been required to include an LCA in their IndWMPs.

Life cycle sustainability assessment and life cycle costing are identified under the “Modelling and Analytics” strategic cluster framing the Waste Research Development and innovation (RDI) Roadmap for South Africa. The 10-year national Waste RDI Roadmap implemented by the Department of Science and Technology (DST) supports the goals of the National Waste Management Strategy (NWMS), National Development Plan (NDP), Industrial Policy Action Plan (IPAP), and Green Economy Accord, by providing the necessary scientific knowledge and technology to improve the manner in which waste is managed in South Africa. The Waste RDI Roadmap implementation includes the aim of developing national capacity in LCA in South Africa, and applying LCA more widely in waste-resource decision-making.

As mentioned in the preceding section, the NCPC-SA has been/is involved in various projects that broadly encompass LCT and LCM. The SWITCH Africa Green project, funded the European Union, assists small, medium and micro-sized enterprises (SMMEs) with the transition towards incorporating resource efficient and cleaner production (RECP) methodologies in their businesses. A significant pilot project under SWITCH Africa Green was the launch of the Industrial Symbiosis Programme³. The NCPC-SA is the custodian of the Gauteng and KwaZulu-Natal Industrial Symbiosis Programmes (GISP and KISP respectively). The Western Cape Industrial Symbiosis Programme (WISP) is managed by GreenCape and fully funded by the City of Cape Town.

LCA in research and academia

South African universities have been active in LCA research since the mid-1990s. The University of Cape Town (UCT), the University of Kwazulu Natal (UKZN) and the University of Pretoria (UP) were the first to produce Masters and PhD theses involving LCA. Post-graduate research subsequently spread to South Africa’s other major universities, including the University of Johannesburg (UJ), Stellenbosch University (SU) and the University of the Witwatersrand (WITS). Life cycle assessment research tends to be within engineering departments, e.g. Chemical and Process engineering (UCT, WITS), Civil Engineering (UKZN, UJ, SU, UP), Industrial Engineering (SU, WITS) and Metallurgy (WITS, UJ). Other departments involved include Agricultural Economics (SU), Health Sciences (WITS), Quality and Operations Management (UJ), Architecture (UP), Forest and Wood Science (SU) and Plant and Soil Sciences (UP).

Other South African universities involved in LCA research include North West University (Engineering), Tshwane University of Technology (Construction, Management and Quantity Surveying), University of South Africa (UNISA) (Environmental Sciences), Nelson Mandela

³ <http://ncpc.co.za/waste/switch-africa-green>

Metropolitan University (SHEQ), University of the Western Cape, Cape Peninsula University of Technology (CPUT), Rhodes University and Durban University of Technology.

A selection of relevant academic publications is listed under References and resources.

Funding for postgraduate LCA research in South Africa is predominantly through the National Research Foundation (an independent government agency). In certain projects, industry funding or in-kind contributions are made from industry, particularly for case studies or part-time students working within particular industries.

LCA research is also established in South African research councils, with the Council for Scientific and Industrial Research (CSIR) identifying the need early on to develop LCA competency. In the late 1990s/early 2000s the CSIR undertook LCAs in the packaging, metal and textiles industries, and were also involved in the development of impact assessment methods for South Africa in partnership with the University of Pretoria. More recently the CSIR have been involved in the life cycle assessment of building materials. The Council for Geoscience (CGS) are also undertaking LCA research in mine water management.

South African academics have a good tradition of presenting their work at international conferences and from the early days of LCA application in South Africa the local LCA research community has had good collaborative links with overseas universities and research groups (see for example the interactions listed in Brent et al. (2002)). A recent example is that of the LCA for SA Food and Agriculture Reduced Impacts (SAFARI) project. This collaboration, funded by the Swiss-South Africa Joint Research Programme, and involving UCT, SU and the Zurich University of Applied Sciences (ZHAW) identified environmental hotspots (and mitigation) in the life cycle of agriculturally produced food products with high relevance in SA.

As primarily a postgraduate pursuit, students doing LCA research have primarily been self-taught or seek outside training. For example, The Green House has been conducting hands-on LCA training courses since 2011, with participants primarily postgraduate students and researchers from universities and research institutes. Life cycle assessment has more recently started to form part of University curricula. WITS teaches life cycle thinking (LCA and water footprinting) concepts to 3rd and 4th year undergraduate Chemical Engineering students without going into detail. As a postgraduate option (short course or MSc), WITS provides a one-day module on LCA as part of a 5-day Civil Engineering course "Design for the Environment" (offered every second year). Now in its third year, UCT offers a 5-day elective course on LCA open to student that have completed three years of study in a science or engineering programme. The course, run within the Chemical Engineering Department, includes an assignment and examination. The first three days of the course is open to external participants, and is administered through UCT's Continuing Professional Development (CPD) Programme. External participants can obtain Continuing Professional Development (CPD) points for attending the course.

LCA in government sector

Uptake of LCA in the government sector in South Africa has been fairly limited. What application there has been has tended to be in co-operation with academia. For example, UKZN has

worked on LCA projects with local government (the eThekweni Municipality) and with the Water Research Commission (who have also worked with other universities on LCA). SU worked with Stellenbosch Local Municipality and the Western Cape Government to apply the Danish EASETECH model to determine the impact of Stellenbosch Municipality's waste management system as well as to evaluate alternative systems.

An exception is GreenCape, a provincial government special purpose vehicle with the mandate of driving the adoption of economically viable green economy solutions from the Western Cape, supported by the Western Cape Government and the City of Cape Town. GreenCape have applied life cycle thinking and LCA in their various programmes, including waste and sustainable agriculture. This included developing regional resource flow models for the Western Cape Department of Economic Development and Tourism (DEDAT) for the livestock, wine, fruit and grain sectors.

Capacity building and international collaboration

International donor funding has played a role in LCA in South Africa, particularly in recent years in convening workshops and funding projects (see Figure 1 and Table 1). UN Environment programmes involving the NCPC-SA, such as the LCM-CMM, provided training and pilot projects. Two UN Environment-funded workshops "Mainstreaming Life Cycle thinking in South Africa" in March 2014 and "Preparing elements for a roadmap of the South African LCA Database" in February 2015 further raised awareness of LCA and the need for a South African LCA database.

Most recently, South Africa was a partner on the Sustainable Recycling Industries (SRI) project, funded by the Swiss State Secretariat for Economic Affairs (SECO) and implemented throughecoinvent. This project saw a number of training events at beginner and advanced levels, as well as networking and knowledge sharing events. Furthermore, the project resulted in significant capacity building in a number of universities and consultancies through projects developing life cycle datasets for the ecoinvent database. A notable feature of the SRI project was the collaboration between academia (UCT) and the NCPC-SA, which together co-hosted the Regional Co-coordinating Centre of SRI project activities in South Africa. The LCA networking and knowledge sharing events held under the final component of this project were notable in the broadening of participants to include not only academia, but also consultants, industry associations and government representatives.

National LCA data

No national LCA database or formal network exists in South Africa, despite various efforts towards this over the years. Informal exchange of LCA studies and events amongst academic colleagues has existed for some years. In 1999 the Pollution Research Group of UKZN initiated a forum of LCA practitioners in South Africa, with support from the CSIR and three South African industries (Eskom, Impala Platinum and SASOL). In the early 2000s there were efforts to formalise and extend the South African forum (essentially an email list of LCA-interested parties) into an African LCA network (ALCANET). Despite initial progress, ALCANET has been largely dormant in recent years.

More recently, various training and knowledge sharing workshops has led to the development of a promising list of active and/or interested stakeholders in LCA (see next section). However, this remains ad hoc and without centralised administration. A platform for sharing LCA-related events and information is planned by the NCPC-SA as a final output of the SRI Capacity building project in South Africa.

Capacity for collection and management of LCA data

Various international collaborations have included training and capacity building in their mandate. UN Environment collaborations with NCPC-SA have tended to focus on building LCA capacity in industry and the public sector, and thus training courses have tended to be at beginner/entry level. Training of direct relevance to the collection and management of LCA data was a one-day workshop on the Global Guidance Principles for Life Cycle Assessment Databases, held in March 2014.

The SRI project in South Africa (implemented through ecoinvent and carried out by UCT and NCPC-SA) had a strong capacity building component. This included both entry level and advanced training. The latter involved two one-day workshops on ecoEditor (one in Cape Town and one in Johannesburg), aimed particularly at LCA practitioners/researchers interested in participating in projects providing data to the ecoinvent database.

Subsequent SRI dataset projects involving universities (UCT, WITS and UJ) and consultancies (The Green House and Blue North Sustainability) built significant capacity in LCI dataset creation, and particularly the rigour required in developing consistent, well-documented datasets.

LCA data collection and availability

A wealth of South African LCA research exists (see Harding et al. (2015)). However exchange of study results, where it occurs, has only been possible through sharing study reports and theses. Thus, there is extremely limited consistency between studies or evidence of South African studies building on each other.

The recent SRI project was a first for LCA projects in South Africa with the specific intent of generating LCI datasets. The SRI/ecoinvent-collaborations produced South African datasets in the following sectors:

- Electricity and coal mining;
- Synthetic fuel production and domestic liquid fuels markets;
- Cement and concrete
- Agriculture and animal husbandry;
- Precious and scarce metals; and
- Road and rail freight.

These datasets were produced in ecoEditor (ecoSpold format). Currently, the potential to utilise these datasets exists only for South African researchers/practitioners with ecoinvent database access. This is because, even though ownership of the datasets rests with the providers, the datasets were developed as unit processes and require inter-linking to become fully operational LCA datasets. Nonetheless, the datasets created are extremely promising as they were particularly chosen for their potential as seeds of a South African database. That is, they cover core processes, such as electricity, liquid fuels and transport, as well as sectors of particular relevance to the South African economy (precious metals and agriculture).

Preceding national LCA database initiatives

The need to harmonise national LCA data has been recognised for a number of years in South Africa. However, without any party having a clear mandate or funding to drive such harmonisation, early efforts have floundered.

A workshop to harmonise South Africa electricity data was held in March 2011, with funding from the inception phase of the SRI project. The workshop was well attended with participants from academia, consulting and industry (Eskom), but yielded results primarily of academic interest (a comparison of the electricity datasets used by the major software providers (SimaPro/ecoinvent and GABI) and of expert adaptations to these datasets by local practitioners).

Interest in - and appreciation of – the need for a national LCA database was evident in the attendance and lively discussion at a UN Environment/Life Cycle Initiative-convened workshop *“Preparing elements for a roadmap of the South African LCA Database”* in February 2015. Over twenty participants from academia, consulting and government research agencies discussed who should be targeted for a national LCA network, what the mission should be and put forward potential organisational and governance structures. The group also brainstormed steps that would be needed for a national database as well as identified priority datasets.

These preceding efforts, as well as further learning and an expanding stakeholder base under the SRI project, provide valuable inputs into the current national database roadmap process.

Stakeholder mapping

This section presents an analysis of LCA stakeholders in South Africa. A first step was to compile a list of LCA stakeholders in South Africa. The list was compiled based on attendees of previous LCA meetings, including the 2014 and 2015 UNEP-convened mainstreaming and LCA database workshops, the two LCA colloquia (2016 and 2017) and the two 2018 knowledge sharing and networking events. The attendees lists were augmented with the authors' own networks, including participants in training courses, SimaPro licence holders, collaborators and clients. This yielded a list of just under 200 active and interested parties, of which 116 had participated in LCA meetings and workshops (85 in the last three years). A larger list of 318 individuals was also compiled during the stakeholder mapping process, which includes attendees of older meetings (e.g. LCM 2009) and enquiries that did not lead to further interactions (e.g. enquiries about LCA training that did not lead to attending a training course). The intention is to use this larger list as a mailing list to inform potentially interested parties about the project.

The active and interested parties identified were then categorised into various stakeholder groups and analysed according to their experience in LCA, as well as their relation to national LCA database development. This analysis is presented below. As well as providing an understanding of the dynamics of the LCA community in South Africa, the analysis was used to identify gaps and stakeholders that could be important in national database development, but who are not currently active in LCA in South Africa. Industry was particularly identified as a gap.

A list of stakeholders is presented in Appendix A. This list aims to cover key organisations and individuals from all stakeholder groups (i.e. it is condensed from the list of active and interested parties compiled and also includes organisations not yet active in LCA but identified as potential stakeholders). An overview of the various stakeholder groups is given in the Stakeholder Groups section below.

Analysis of the South African LCA community

The following analysis is based on the stakeholder list described above, i.e. attendees at LCA meetings and workshops over the past five years and the authors' own networks. The analysis that follows focuses especially on stakeholders that have shown a recent interest in LCA (the past three years). The analysis is also informed by a survey undertaken by the NCPC-SA and UCT during the SRI Training and Capacity building project. The online survey gauged the experience and training needs of 45 participants.

Figure 2 provides an analysis of LCA active and interested parties identified in South Africa. The 197 stakeholders were categorised into academia (universities and technical colleges), research (government research agencies), industry, consultants (engineering and environmental consultants), public sector (government and its agencies e.g. NCPC-SA), NGOs and others (e.g. GIZ, SECO). A very similar proportional breakdown in stakeholders was obtained when analysing the smaller recently active stakeholder group, as shown in Figure 3, and also the larger mailing list group, indicating that the stakeholder breakdown is relatively robust. A similar trend in stakeholder groups is also obtained in the online survey results.

The only grouping that varies significantly across the different stakeholder samples is the public sector, which is highest in the recent meetings (at 26%) and lowest in the online survey (at 13%). This is likely to be due to the fact that the stakeholder samples based on meeting attendees have a bias towards public sector participation as they were organised by the NCPC-SA, and a relatively large number of NCPC-SA personnel attended the meetings.

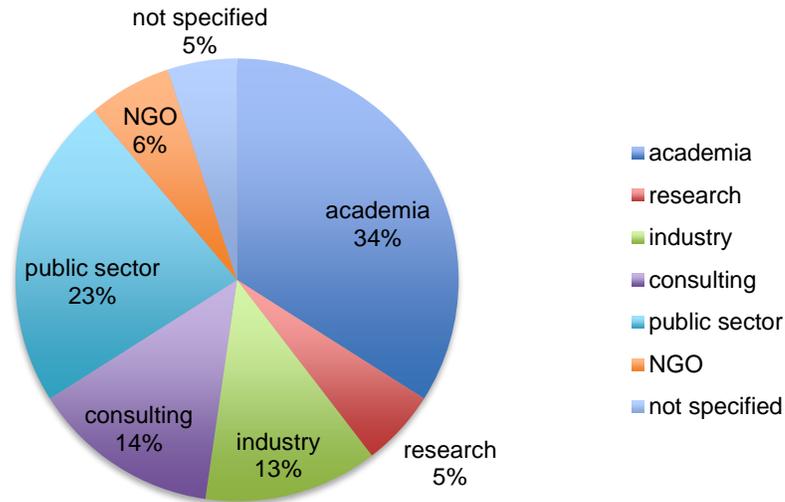


Figure 2: Breakdown in LCA active and interested parties in South Africa

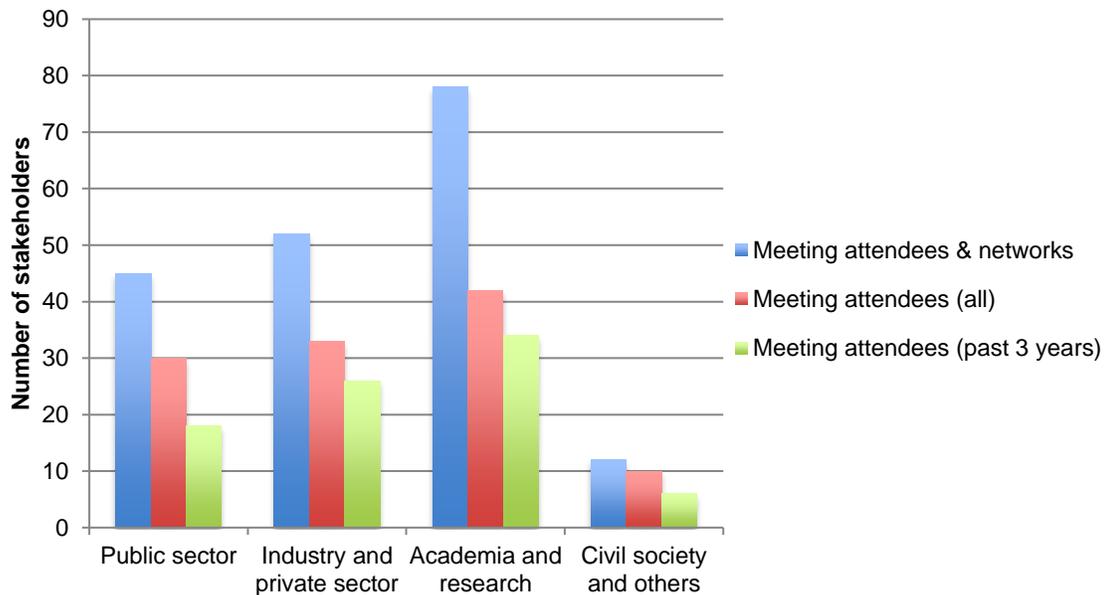


Figure 3: Analysis of three groups of LCA active and interested parties in South Africa

Experience in LCA is not spread evenly through the stakeholder groups. Figure 4 gives an approximate mapping of LCA stakeholders according to their experience in LCA and their influence in developing a national LCA database. The stakeholder map is based on the

SRI/NCPC/UCT on-line survey on LCA training needs in South Africa (with a rather small sample size of 45 participants) and the authors' experience of working within the LCA community. The map should therefore only be taken as indicative. The size of the different stakeholder groups (i.e. the relative size of the circles in Figure 4) is derived from the stakeholder list discussed above. The relative placing of the circles in the quadrant is of no significance (i.e. the percentage of the groups were only classified as high/low and not rated relative to each other).

The academia and research group has the highest percentage of stakeholders active and with knowledge of LCA. The SRI online survey indicated that 40% of respondents were experienced with LCA, with 20% of respondents unfamiliar with LCA and 40% indicating they had some knowledge of LCA. Just under 50% of respondents indicated they had read or conducted an LCA. The academic group of respondents indicated the highest level of LCA knowledge (with 50% considering themselves experienced with LCA) and government respondents indicated the lowest LCA knowledge (with 25% considering themselves experienced).

Figure 4 indicates that those stakeholders with the highest potential for organising and maintaining a national database (i.e. government agencies) are currently those of lowest LCA knowledge. Academics and consultants comprise the greatest number of stakeholders with experience in LCA as well as potential to benefit from a national LCA database (as the biggest group of users of LCI data). They however have the lowest potential to organise and run a national database. Industry stakeholders, especially industry associations, currently have little direct experience in LCA (with the exception of the Clay Brick Association), but have demonstrated interest in LCA by their participation in LCA meetings (although this still needs to be grown). Relatively few industry stakeholders are active in LCA. Industry stakeholders are placed in the "high influence" quadrant, as their collaboration is needed to provide the data for national database. They also stand as significant beneficiaries of a national database (through LCA studies delivering enhanced environmental decision making, process improvements and marketing opportunities) albeit this use of LCA data likely to be realised through collaboration with consultants and researchers. Certain public sector companies, such as Eskom (electricity) and Transnet (freight transport), as well as municipalities (water and waste management data), are in a similar position of influence to industry stakeholders, and this stakeholder group similarly needs to be grown for a successful national database.

Civil society (NGOs and not-for-profits) comprises a relatively small group of LCA stakeholders in South Africa. Nonetheless, they are deemed to be of relatively high influence in developing a national LCA database in that they are often provide a respected opinion (due to their non-partisan nature). WWF-SA also have experience in LCA and have played an important catalysing role in getting industry interest in LCA studies.

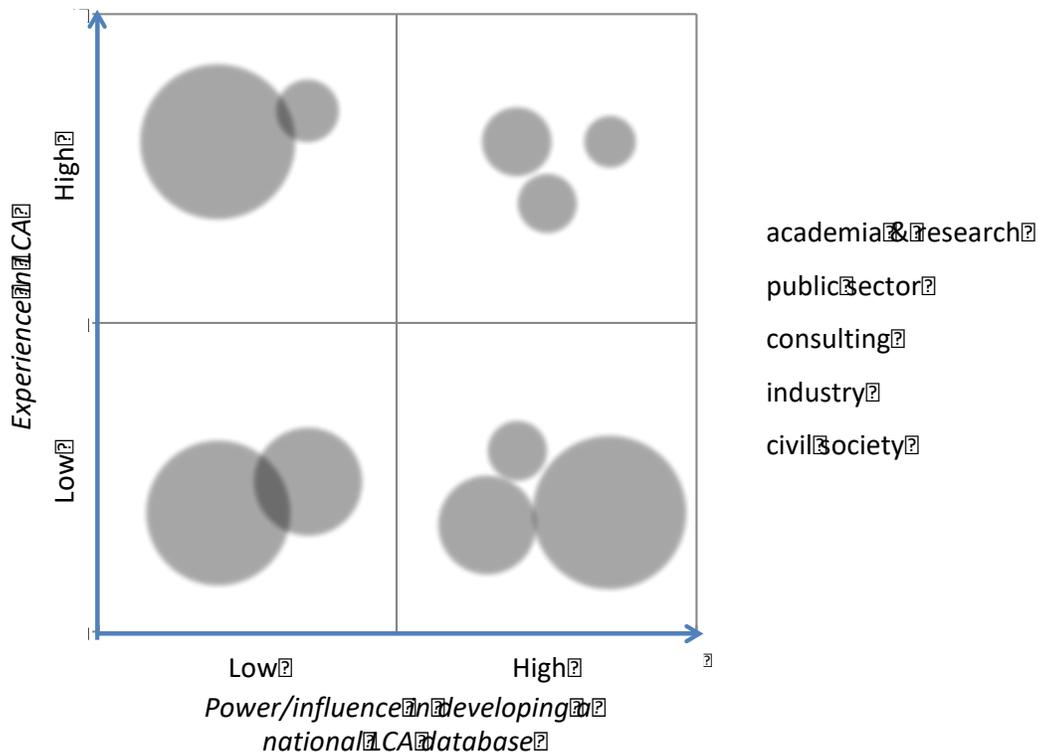


Figure 4: Approximate mapping of LCA stakeholders in South Africa

Stakeholder groups

The following sections pick out key stakeholder groups to be considered in the national LCA database roadmap process. Representation of key stakeholders/organisations on the National Database Working Group (NDWG) is also discussed (recognising that discussions around participation on the NDWG are on-going and the participation of individuals/organisations mentioned is provisional).

Public sector

Key national government departments include: the Department of Environmental Affairs (DEA), the Department of Science and Technology (DST) and the Department of Trade and Industry (the dti). Contacts have been established in these departments and dialogue is underway regards their participation in the development of the national database roadmap.

Other government departments that have shown an interest in LCA through participation in LCA events or queries include the Department of Agriculture, Forestry and Fisheries (DAFF) and the Department of Water and Sanitation. Other relevant government departments potentially include

The participation of NCP-C-SA (Lee-Hendor Ruiters) has been secured in the database roadmapping process, continuing their increasing role in promoting LCA in South Africa.

Participation on the NDWG of Prof Linda Godfrey has also been secured, in her capacity as Manager of the Waste RDI Roadmap Implementation Unit, DST.

Provincial government special purpose agencies with experience in LCA include the Innovation Hub (Gauteng government) and GreenCape (Western Cape government). Contacts within these agencies are well established and have been invited for participation on the NDWG.

Local government is not well represented in the LCA community, which represents a potentially important gap as local municipalities are responsible for water and waste management services. However links with those working with local municipalities are established (GreenCape and UKZN) which will be explored to attempt direct contacts to relevant individuals.

Other public sector entities of relevance include the state-owned enterprises, including electricity provision (Eskom) and Transnet (National Ports Authority, Port Terminals, Freight rail and Pipelines). These companies represent important contributors of LCA data on key economic sectors in South Africa. Eskom has historically been involved in LCA in South Africa, with competence in LCA built up in the early 2000s, but contacts/interest needs to be revived. Transnet are currently active in LCA through academic collaboration and a relevant contact will be pursued for participation in the Roadmap.

Industry and the private sector

The private sector makes up around 30% of the identified LCA active and interested parties, split evenly between consultants and industry. These two private sector groups are discussed separately, as whilst consultants are the group with the higher number of experienced and/or interested stakeholders, as well as being a group with much to gain from increased LCA data availability in South Africa, they have relatively little influence in the development of a national database. Industry, on the other hand, are a group that needs further attention in securing their participation, given that the participation of key industries will be essential in developing South African specific datasets.

Consultants:

A fairly large number of consultancies are identified in the stakeholder list in Appendix A (i.e. have demonstrated some degree of interest in LCA). The majority of consultancies have limited direct LCA experience (especially in dataset development) but hold the potential to build on carbon footprinting and water footprinting experience, and to extend general engineering and/or environmental consulting with insights provided by LCA.

Direct experience in dataset creation and database formats is especially limited, with participants in the SRI/ecoinvent data collection projects the exception here. The Green House has extensive experience in LCA having conducted a number of LCAs over the past decade, primarily in collaboration with WWF-SA, as well as developing datasets for ecoinvent in the energy, agriculture and transport sectors. Blue North Sustainability has expanded their extensive product carbon footprinting experience into LCA and has dataset development experience in the agricultural sector.

International consultancies, including Quantis, ThinkStep, Cadis and others, have worked/are working with South African companies, but have not been included in the stakeholder list in Appendix A (with the decision to limit the stakeholders to South African entities or entities with divisions in South Africa).

Industry:

Various companies in the retail, food, fast moving consumer goods, and mining industries have commissioned LCA studies in South Africa. These are listed in Table 1 but are not included in the stakeholders listed in Appendix A because in most cases these studies were carried out by a third party for a particular division or operational decision. The industry contact thus had high interest in the study results and its implications for their business but little interest in the LCA process.

Private sector participants at recent LCA events are included in Appendix A and cover the following sectors: banking, waste and recycling, mining, packaging, building materials, pulp & paper and sugar.

Industry associations and business organisations are thought to offer the most potential for partners in a national database initiative. Industry associations that have shown interest/attended LCA meetings include: The Clay Brick Association, Plastics SA, International Platinum Association, South African Sugar Association and SASSDA (Southern Africa Stainless Steel Development Association).

Business organisations, such as the National Business Initiative and Business Unity South Africa, are also potentially valuable stakeholders. Attempts to make contact with suitable individuals in such organisations will be attempted during the establishment of the NDWG and during the roadmapping process.

Academia and research

Universities and research agencies provide the highest number of stakeholders, with fourteen universities and four research institutes working with LCA in some capacity. These are listed together with key contacts in Appendix A.

Academia and research will be represented on the NDWG by UCT (Prof Harro von Blottnitz), WITS (A/Prof Kevin Harding) and the CSIR (Prof Linda Godfrey).

Civil society and others

WWF-SA have high interest in the use of LCA to inform their environmental advocacy work and through their industry partnerships have instigated a number of LCAs. WWF-SA have provisionally agreed to represent civil society on the NDWG.

Other civil society organisations that have participated in LCA events include other conservation NGOs, waste and recycling organisations and funders/donors such as GIZ and USAID South Africa Low Emissions Development (SA-LED).

Organisation of the national LCA community

There is currently no formal organisation within the national LCA community. Practitioners and academics have their own informal networks built up through past collaborations. Recent networking meetings and colloquia have offered a good platform for exchange and building up

informal contact lists. The NCPC-SA, as organisers of the recent meetings and other industry trainings have a large mailing list. An output of the final SRI-project collaboration in South Africa is an online platform to be hosted by the NCPC-SA that can potentially offer a place for dialogue and exchange. Various informally organised social networks also exist (e.g. an SA LCA twitter account set up by Kevin Harding at WITS).

International connections and collaborations

South African academics are well connected with international colleagues. Connections exist to the Life Cycle Initiative (Kevin Harding), SETAC Global LCA group (Pippa Notten) and LCM steering committee (Harro von Blottnitz), amongst others.

The NCPC-SA are linked to a number of EU and UN Environment programmes, for example, SWITCH Africa Green.

A number of South African universities and consultancies and the NCPC-SA were partners on the SRI project (implemented through ecoinvent and funded by SECO). As well as capacity building and training, this project delivered core LCI datasets across a number of key sectors.

Conclusions and recommendations

The baseline assessment and stakeholder mapping show that LCA has a well established base in South Africa. Academics and consultants, as the main generators of LCA studies, comprise the highest numbers of organisations and individuals active in LCA in South Africa. LCA studies have found application in a wide range of industry sectors, including energy, chemicals, fast moving consumer goods, retail, agriculture and mining. Application of LCA in industry has been either through self-funded projects (most often the larger multinationals) or in partnership with academia, NCPA-SA (with a focus on SMEs) or WWF-SA. Application of LCA in industry has also been catalysed by Industry Associations (e.g. Clay Brick Association, International Platinum Association and South African Sugar Association). The tentative interest shown in LCA by other industry associations needs to be encouraged, as well as links explored with other business organisations so as to ensure increasing industry participation in LCA in South Africa.

The public sector has historically been the least engaged with LCA in South Africa. However participation of government representatives at recent LCA events show an increasing engagement with LCA by government. The increasing role being played by NCPA-SA has been a catalysing factor here.

This increasing government and industry participation in LCA, together with a strong research base, hold promise for an engaged stakeholder group for the national LCA database roadmapping process. A *National Database Working Group* (NDWG) of eight to ten members is planned, with representation across all stakeholder groups identified in the stakeholder mapping (academia and research, public sector/government, civil society and industry). Dialogue has been established with key members of these stakeholder groups. The process is still underway, but participation has provisionally been secured from the public sector (NCPA-SA, GreenCape, DST), civil society (WWF-SA) and academia (WITS, UCT). The most relevant partner for Industry/private sector representation is still under decision. A first NDWG engagement is planned for early 2019, with three subsequent engagements planned (at least two of the four planned engagements will be physical meetings).

At the same time, it is important that the roadmap process be an open and participatory process. Thus, notices will be posted on suitable platforms and social media and emails sent to the mailing list developed as part of the stakeholder mapping process. Individuals/organisations will be invited to register as interested parties, either to be kept informed of the roadmap process and to be potential partners for future activities (including the launch event at the end of the project) and/or to act in the capacity of reviewers of the roadmap. Individual requests/contacts will be made if sufficient responses are not obtained for reviewers from the call for interested parties. Obtaining strong stakeholder participation in the roadmap process will be prioritised by the project team so as to ensure that the roadmap developed is well supported by the South African LCA community.

References and resources

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Resources - Sample of recent South African LCA publications and research reports^{4,5}:

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⁴ With thanks to Kevin Harding at WITS for sharing the references to the review article under preparation: Status and Prospects of LCA research in South Africa

⁵ This list is limited to life cycle assessment studies. The wealth of water footprinting research in South Africa, and to a lesser degree carbon footprinting research, has not been included.

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Appendix A - List of stakeholders

| Sector | Stakeholder | Involvement | Contact person |
|-------------------------|------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------|
| Public | Department of Agriculture, Forestry and Fisheries (DAFF) | - | Andrew Partridge |
| | Department of Environmental Affairs (DEA) / Environmental Advisory Services Branch | - | Peter Lukey (Chief Policy Advisor: Strategic Environmental Intelligence) |
| | Department of Science and Technology (DST) | - | Magamase Mange (Deputy Director: Green Economy) |
| | Department of Trade and Industry (the dti) | - | Ilze Baron / Bernd Oellerman (Director: Regional Industrial Development) |
| | Department of Water and Sanitation | - | Herman Shokane |
| | National Cleaner Production Centre (NCPC-SA) | direct | Lee-Hendor Ruiters |
| | South African National Energy Development Institute | - | Sibbele Hietkamp |
| | GreenCape | direct | Cathy Pineo; Lauren Basson |
| | The Innovation Hub (Gauteng Growth and Development Agency) | - | Rethabile Melamu (General manager: Green Economy) |
| | Eskom | indirect | Gina Downes |
| | Transnet | direct | Ndafika Baleni |
| Industry/private | | | |
| Consulting | Blue North Sustainability | direct | Anel Blignaut; Eddie Vienings |
| | Digby Wells Environmental | - | Barbara Wessels |
| | Ecointelligent Engineering | - | Velin Govender |
| | Equispectives Research and Consulting Services | direct | Ilse Aucamp; San-Marie Aucamp |
| | Green Vision Consulting | - | Ntseketsi Lerotholi |
| | JG Afrika | - | Sally-Anne Kasner, Bonte Edwards |
| | NCC Environmental Services (Pty) Ltd | - | Carlene van der Heiden |
| | Prometheum Carbon | - | Harmke Immink |
| | The Green House | direct | Pippa Notten |
| | Trade & Industrial Policy Strategies (TIPS) | - | Gaylor Montmasson-Clair; Bhavna Deonarain |
| | WSP Parsons Brinckerhoff | - | Gregory Rice |
| | Zzwavel Environmental Consulting | direct | Zubeida Zwavel |
| Industry | AJ Polycycling | - | Deenadayalan Moodley |
| | AngloGold Ashanti | - | Rathipa Rampedi |
| | De Beers | - | Lesley Roos |
| | Don't Waste Services | - | Björn Plüg |
| | Mpact | - | Njabulo Hlophe; Michele Venter |
| | Nedbank | - | Rosalind Dos Santos |

| Sector | Stakeholder | Involvement | Contact person |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------|
| | Saint Gobain | - | Thato Nhasengo |
| | Sappi | - | Liana van Zyl. Krelyne Andrew |
| | South32 | - | Lebo Serithi |
| | Standard Bank | - | Willem Prinsloo |
| | Tongaat-Hulett Sugar (Pty) | - | Gavin Lambert |
| <i>Industry Associations</i> | Business Unity South Africa (BUSA) | - | <i>to be established</i> |
| | Chemical and Allied Industries' Association (CAIA) | - | Glen Malherbe |
| | Clay Brick Association | - | Nico Mienie |
| | Minerals Council South Africa (formerly Chamber of Mines) | - | <i>to be established</i> |
| | National Business Initiative (NBI) | - | Steve Nicholls |
| | PETCO | - | Cheri Scholtz; Oscar Baruffa |
| | Plastics SA | - | Douw Steyn |
| | SASSDA (Southern Africa Stainless Steel Development Association) | - | Michel Basson |
| Academia and research | Cape Peninsula University of Technology | direct | Munira Allie; Johan van Niekerk |
| | Council for Geoscience / Unit for Environmental Geosciences | direct | Godfrey Madzivire; Thakane Ntholi |
| | Council for Scientific and Industrial Research / Built Environment | direct | Mark Rohwer; Zonke Dumani |
| | Durban University of Technology | direct | Oludolapo Olanrewaju |
| | National Institute for Occupational Health | - | Wells Utembe |
| | Nelson Mandela Metropolitan University | direct | Litha Dalindyebo |
| | North-West University/ Faculty of Engineering/ Focus Group for Integrated Energy and Energy Efficiency | direct | Jan van Ravenswaay |
| | Rhodes University | direct | Richard Laubscher |
| | Stellenbosch University: Department of AgriScience/ Agricultural Economics Department of Civil Engineering/ Geotechnical and Transport Engineering; Unit for Construction Materials Department of Industrial Engineering/ Sustainable Systems Department of Forest and Wood Science Department of Process Engineering | direct | Theo Kleynhans / Chantal Rudman; Wibke de Villiers / Alan Brent; Dirkse van Schalkwyk / Brand Wessels / Johann Gorgens |
| | Tshwane University of Technology/ Department of Environmental, Water and Earth Sciences | direct | Lizzy Monyatsi |
| | University of Cape Town/ Department of Chemical Engineering/ Environmental and Process Systems Engineering | direct | Harro von Blottnitz |
| | University of Johannesburg: Department of Metallurgy / Mineral Processing and Technology Research Centre Department of Quality and Operations | direct | Antoine Mulaba / Agata Lo Giudice; Charles Mbohwa; Anup Pradhan; Michael Mutingi / Rachel Muigai/ Clinton Aigbavboa; |

| Sector | Stakeholder | Involvement | Contact person |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------|
| | Management Department of Civil Engineering Department of Construction Management and Quantity Surveying | | Wellington Thwala |
| | University of KwaZulu Natal: Department of Civil Engineering/ Centre for Research in Environmental, Coastal and Hydrological Engineering Department of Chemical Engineering/ Fibre-Processing Research Group | direct | Elena Friedrich / Iain Kerr |
| | University of Pretoria Department of Plant and Soil Sciences/ Agronomy and Soil Science Department of Civil Engineering/ Pavement Engineering Department of Architecture | direct | Michael van der Laan / Wynand Steyn / Piet Vosloo; Dieter Holm |
| | University of South Africa Department of Civil and Chemical Engineering/ Material and Process Synthesis Engineering Department of Environmental Sciences | direct | Xinying Liu / Roelien du Plessis |
| | University of the Witwatersrand: School of Mechanical, Industrial and Aeronautical Engineering/ Aeronautical Stream School of Chemical and Metallurgical Engineering/ Hydrometallurgy and Sustainable Development; Industrial and Mine Water Research Unit; Sustainable Process Systems Engineering Department of Health Sciences/ Public Health | direct | Claudia Polese / Sehliselo Ndlovu / Kevin Harding / Thokozani Majosi / Derk Brouwer |
| | University of Zululand | direct | Linda Linganiso |
| | Water Research Commission | direct | Valerie Naidoo; Sudhir Pillay |
| Civil Society | Conservation South Africa | - | Kgomotsa Matthews |
| | SA-LED | - | Melusile Ndlovu |
| | WWF-SA | direct | Tatjana von Bormann |