

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

Deliverable D 2.1 Report on baseline assessment and stakeholder mapping in Brazil

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Life cycle assessment (LCA) in Brazil

Introduction and background

The Brazilian Life Cycle Community has increased along the years, as a result of several stakeholders. It started in the early 2000 in academia (first PhD thesis at Unicamp and USP) and at a research institution (CETEA), business experience in Natura, a cosmetic company, and continued to grow with the Brazilian Life Cycle Assessment Program (PBACV), the Brazilian Institute of Information in Science and Technology (IBICT) and the National Institute of Metrology, Quality and Technology (INMETRO), the Brazilian Agricultural Research Corporation (EMBRAPA), the Brazilian Life Cycle Association (ABCV), and the Brazilian Business Life Cycle Network (Rede ACV) (Maia et al., 2017).

As for a national LCA database, a project commissioned/funded by the Ministry of Science, Technology, Innovation and Communication (MCT) through Financiadora de Estudos e Projetos (FINEP), entitled Life Cycle Inventory for Environmental Brazilian industry, was coordinated by IBICT and Inmetro and executed by IBICT in partnership with University of Brasilia (UnB), University of Sao Paulo (USP) and Federal University of Technology – Paraná (UTFPR) in the early 2000. In this context it was (i) developed the life cycle database; (ii) developed an inventory methodology that describes quality and techniques for defining and limiting the scope for data collection, according to ISO 14040 and 14044; (iii) initiated a standardization of Brazilian terminology in LCA, and (iv) three pilot inventories were developed and made available on the website.

Since then, there has been several capacity building efforts, from the first awareness raising "Strategies to Consolidate LCA Methodology in Brazil" in 2004 followed by a series of capacity building workshops funded byecoinvent (Hischier et al., 2009). The content of the workshops spanned from overview of LCA methodology, through governance and technical aspects of establishing an LCA database. At that time, the three points that the participants raised were: the need of quality guidelines; the need for increasing the capacity on developing LC datasets and to engage the private sector in data collection.

Later, since 2008, a Life Cycle Brazilian Management Conference takes place in even years with an attendance of 150-200 participants, there is a Brazilian Programme on Life Cycle Assessment (PBACV) since 2010 under the Ministry of Development, Industry and Commerce, a stakeholder consultation takes place in odd years (Forum ACV), there are two labeling systems available (Inmetro and EPD International), the Life Cycle Database (SICV) was launched on March 2015 and it is currently running a public policy for biofuels (RenovaBio).

LCA in industry and the private sector

The first LCA in industry was performed in Natura, a cosmetic company. At first, limited to the evaluation of packaging alternatives, Natura supported the development of new methods for incorporating life cycle assessment in the product development.

Currently, there are some companies interested in Life Cycle Assessment and Thinking, mainly from medium and big sized companies. On the other hand, there is a concern regarding the commercial barriers that might reduce the competitiveness especially of small companies.

Those companies interested in LCA founded Rede ACV, formalized as an association since 2017, which promotes LCA. Currently Rede ACV is led by Braskem and Grupo O Boticário. Rede ACV has been supporting capacity building, demanding LC database and partnering with several stakeholders.

Recently, there are two labeling systems available (Inmetro and EPD International), but very few EPDs were published, all of them from materials for the building sector.

Among the consulting companies, two of them are working exclusively with LCA in the country.

LCA in regulations and public policy

The Brazilian Solid Residues Policy includes the shared responsibility of solid residues along the Life Cycle, the stimulus for the implementation of LCA, the possibility of public policies for innovation based on life cycle thinking (Brazil, 2010a).

Recently a state policy that aims to recognize the strategic role of all types of biofuels in the Brazilian energy matrix, both for energy security and for mitigation of reduction of greenhouse gas emissions in the life cycle (RenovaBio).

Besides, the Brazilian Life Cycle Assessment Program (PBACV) establishes guidelines to support the sustainable development, the environmental competitiveness of Brazilian industrial production and to promote access to internal and external markets. PBACV intends to (Brazil, 2010b):

- implement a system for organizing, storing and disseminating standardized information on Life Cycle inventories of Brazilian industrial production recognized internationally;
- disclose and disseminate the Brazilian inventories methodology;
- elaborate the basic inventories of the Brazilian industry;
- support the development of critical mass;
- disseminate and support information on life-cycle thinking;
- intervene and influence the work of international and national standardization related to the theme;
- identify the main categories of environmental impacts for Brazil.

LCA in research and academia

One of the results of the efforts in Brazil is the increasing number of capacity building. Life Cycle Brazilian Management Conference began with an attendance of 75 participants in 2008, and nowadays there are around 150-200 participants.

LCA is included in several post-graduation programmes at the universities (non exhaustive) listed below in alphabetical order:

- Federal University of Ceará (UFC)
- Federal University of Grande Dourados (UFGD)
- Federal University of Piau  (UFPI)
- Federal University of Rio de Janeiro (UFRJ)
- Federal University of Rio Grande do Sul (UFRGS)
- Federal University of Technology of Paran  (UTFPR)¹
- Federal University of Santa Catarina (UFSC)
- Sao Paulo State University (UNESP)
- State University of Santa Cruz (UESC)
- State University of Southwestern Bahia (UESB)
- University of Bras lia (UnB)¹
- University of Campinas (Unicamp)
- University of S o Paulo (USP)¹

LCA is also used by several research institutes, main ones listed below in alphabetical order:

- CETEA (Center of Packaging Technology)
- CTBE (Center of Technology of Bioethanol)
- Embrapa (Brazilian Agricultural Research Corporation)
- IBICT (Science and Technology Information Brazilian Institute)
- IPT (Technological Research Institute)

Main sources of funding for LCA are international (UNEP, the Life Cycle Initiative, European Commission, Swiss State Secretariat for Economic Affairs, SECO/theecoinvent Association), the majority for capacity building.

The national governmental agencies (CNPq, FINEP) and private companies fund research. Nevertheless, in the case of national governmental agencies, the last years did not provide any specific support for research in LCA. As a consequence, LCA researchers do not often lead a research proposal or the proposals need to be of small budgets or linked to application problems (for example, comparison of technologies).

National LCA data

Capacity for collection and management of LCA data

There have been several capacity building efforts, from the first awareness raising '*Strategies to Consolidate LCA Methodology in Brazil*' in 2004 followed by a series of capacity building workshops (Hischier et al., 2009). The content of the workshops was from overview of LCA methodology, through governance and technical aspects of establishing an LCA database. At that time, the three points that the participants raised were: the need of a quality guidelines; the

¹ Contributed to PBACV creation (Brasil, 2010a)

need for increasing the capacity on developing LC datasets and to engage the private sector in data collection.

Since then there were events on LCA database and data collection in the Brazilian LCM Conference and the Brazilian LCA Forum.

More recently, to include datasets in the national database (SICV) launched in 2015, a workshop to populate took place, increasing the capacity in the country, was funded by UNEP in the same year. This has resulted in the majority of datasets that are currently available in SICV (16 datasets), some of them available at GLAD.

In 2015 and later on 2017-2018, the funding from the Swiss State Secretariat for Economic Affairs (SECO), through the '*Sustainable Recycling Industries*' (SRI) project, contributed for increasing awareness and capacity building in the country (acvdeaz.org). Overall more than 600 people participated in the workshops. In Table 1, however, only the capacity building on Life Cycle Datasets Development and LCI Calculations are presented. Besides those, in the Brazilian LCM Conferences there have been often short courses on the topic.

Table 1: Overview of capacity building through Workshops in Brazil

Item	Hischier et al. (2009)	UNEP (2015)	ecoinvent (2018)*
Target group	Interested persons	LCA basics	LCA basics
Governance	X		
LCA methodology	X		X
Dataset development	X	X	X
Database and LCI calculation	X		X
Estimate of participants	10	20	50

* It was only considered the capacity building related to datasets development and LCI calculation

LCA data collection and availability

The national LCA database of Brazil (SICV) was launched on March 2015 and currently contains 16 datasets, from which 13 as unit processes and 3 aggregated LCIs, mostly available from previous data collection and adaptations performed as a result of the workshop funded by UNEP (2015). From the total, 11 of them has a country coverage and the others State coverage (soybean). The reference years of the datasets vary from 1977 (hydropower) to 2012 (soybean) while the valid years of the datasets vary from 2012 (eucalyptus) to 2074 (hydropower).

Despite the fact that capacity was built and a minimum set of quality requirements (QualiData) were set (IBICT, 2016), the number of datasets did not increase significantly. On 2017-2018, a funding from ecoinvent/SECO, through the SRI Project, contributed for the development of hundreds of datasets available freely to be included in SICV in agriculture, building materials, electricity and hotels. The limitation, however, is that the format of these datasets (EcoSpold2) are different from SICV (ILCD) and hence require conversion prior to being take up into SICV.

Furthermore, currently there are two different, but complementing ideas to improve the Life Cycle Database in Brazil, one to develop datasets from the scratch and the other to adapt datasets from existing sources.

LCA data needs

The data needs have already been identified and provided by the Technical Committees of Database and Inventory of the Brazilian Program of Life Cycle Assessment (PBACV), which consulted private and academic stakeholders, based respectively on datasets that are highly used by studies and datasets with high contribution to potential environmental impacts of Brazilian products. Once these datasets are developed, it is necessary to identify what would be the updated list of processes. Besides, it is important to highlight that in both cases, processes without environmental data were not identified as significative.

Preceding national LCA database initiatives

The initial development of the national LCA database for Brazil (SICV) was described in preceding sections.

National LCA data - conclusions

All in all, it is possible to conclude that there are several activities related to LCA in Brazil:

- a high level commitment in LCA topic in Brazil (PBACV);
- an established Life Cycle database (SICV);
- limited governance of the database (IBICT);
- LCA networks (ABCV, Rede ACV, ACV de A a Z, RAICV, GTACV-S);
- a demand from the private sector (companies through Rede ACV);
- quality requirements (QualiData);
- some people with capacity to develop datasets (through participation in trainings supported by UNEP, SRI Projects, etc. and post-graduation programmes in several Universities) and;
- a body of datasets freely available (SRI Project; Master, PhD studies, publications).

Nevertheless, despite all of these, the number of datasets available at SICV has not increase significantly since 2015 and there are still very few uses in public policy (RenovaBio) and the private sector, which urges for a roadmap for the Brazilian case to guarantee the dissemination of LCA and further improving data availability and consistency in Brazil.

Stakeholder mapping

Stakeholder groups

Stakeholder groups were identified based on the level of contribution to the LCA discussion in the Brazilian LCM Conference, LCA Brazilian Forum, existing networks and on papers Zanghelini et al. (2016) and Maia et al. (2017).

Public sector

The steering committee (SC) of PBACV includes several stakeholders from academia, Governing Bodies, public agencies, and associations. The SC is responsible for the strategic level of the PBACV. There are different levels of reasons to be part of the SC: i) update on LCA activities; ii) use of LCA in public policies; iii) concerns on mandatory green procurement based on LCA; iv) guarantee the competitiveness of National products in restricted markets; v) provide environmental information related to national processes and products; vi) identify collaboration and funding opportunities. Some of the Governing Bodies are:

- Ministry of Agriculture
- Brazilian Institute of Environment and Renewable Natural Resources
- Ministry of Development, Industry and Commerce
- Ministry of Energy
- Ministry of Environment
- National Council for Scientific and Technological Development
- National Industry Confederation
- Ministry of Science, Technology, Information and Communication
- Oil National Agency
- National Standardization Association
- Water National Agency

Industry and the private sector

The Rede ACV began as an informal network and has been operating since 2012 (CEBDS, 2017). Recently, Rede ACV transformed into an association of companies and consultancies (13) in 2017 led by Braskem and Grupo O Boticário. Since this year, the Rede ACV includes also representatives from research institutes and academia (10 institutions). The objectives of the Rede ACV are to promote the cooperation environment between companies interested in use of LCA in Brazil, to educate and empower companies on the concept, application and benefits of LCA; to disclose and disseminate LCA information in Brazil, to influence and support the government to improve the Brazilian Database. There are five working groups, from which one is related to database and the other one to awareness raising. The companies in the network present different levels of LCA, from those in the early stages to build capacity to those that bring value to LCA studies. An example of the latter is Braskem. The main drivers of the

private sector interest in LCA are twofold: opportunity for green markets through LCA/EPDs, inclusion of LCA in sustainability reports. Recently there has been a demand on Life Cycle Thinking due to the new version of ISO 14001.

Sector associations are also part of PBACV's management committee: Electric and Electronics Industry, Industrial Development and Portland Cement.

Academia and research

Academia is concerned in answering some questions, for example: the identification of best LC approaches; development of new LC approaches; recommendation of models; improvement the quality of indicators, among others. Although several studies have been published since the beginning of the century and the wishes to support the developments of datasets, the lack of an appropriate mechanism of funding and valorization of this activity refrains academia to contribute more to SICV. Even so, due to the contribution for sustainability that can be brought through using LCA and the opportunity to research in this topic, there are several universities, colleges/universities of applied science, public/private research institutes, and others working for increase the knowledge and the capacity building in LCA in different levels (undergraduate, MSc. PhD.) and short courses:

- Federal University of Ceará (UFC)
- Federal University of Grande Dourados (UFGD)
- Federal University of Piau  (UFPI)
- Federal University of Rio de Janeiro (UFRJ)
- Federal University of Rio Grande do Sul (UFRGS)
- Federal University of Technology of Paran  (UTFPR)
- Federal University of Santa Catarina (UFSC)
- Sebrae
- Sao Paulo State University (UNESP)
- State University of Santa Cruz (UESC)
- State University of Southwestern Bahia (UESB)
- University of Bras lia (UnB)
- University of Campinas (Unicamp)
- University of S o Paulo (USP)

Research institutes combine the concern academia and the public and private sector. The main research institutes acting in LCA are listed below in alphabetical order:

- CETEA (Center of Packaging Technology)
- CTBE (Center of Technology of Bioethanol)
- Embrapa (Brazilian Agricultural Research Corporation)
- IBICT (Science and Technology Information Brazilian Institute)
- Inmetro (National Institute of Metrology, Quality and Technology)
- IPT (Technological Research Institute)

There are also informal research networks aiming to develop specific LCA methods; recommend models and increase the capacity building in Brazil and neighbor countries:

- Brazilian LCIA Research Network
- Brazilian Working Group on social life cycle assessment (S-LCA).

Civil society and others

There are also NGOs in Brazil, main listed below:

- Akatu Institute (consumer)
- Brazilian Life Cycle Assessment Association (organizes Brazilian LCM Conference)
- FEE (Fundação Espaço Eco)
- Fundação Vanzolini

Organisation of the national LCA community

The national LCA community in Brazil consists of both formal and informal organizations for stakeholders. In addition, there are several reoccurring events that offers forums for interaction:

Formal organizations

- Brazilian LCA Programme (PBACV)
- Brazilian LCA Association (ABCV)
- Brazilian Business LCA Network (Rede ACV)

Informal organization

- ACV de A a Z
- Brazilian LCIA Research Network (RAICV)
- Brazilian Working Group on S-LCA (GTACV-S)

Forums:

- Brazilian LCM Conference, even years
- Brazilian LCA Forum (BRACV), odd years²
- PBACV and Rede ACV meetings

International connections and collaborations

IBICT is a member of the UN Environment's Global LCA Data Access (GLAD) network and has obtained funding for joint projects between Brazil and Europe. Several Brazilian actors have obtained funding (2017-2018) from the call for tender for capacity building and datasets development within the Life Cycle Inventory component of the SRI Project (SRI-LCI), funded by the Swiss State Secretariat for Economic Affairs (SECO) and implemented by theecoinvent Association.

Selected examples of international cooperation with relevance to the national LCA community in Brazil:

² A stakeholder consultation takes place in odd years (Forum ACV) as a bottom-up approach to define the main targets to be reached by the LC Community in a two years period.

1. UNEP and The Life Cycle Initiative – long term collaboration including GLAD, GLAM, Social LCA and other. Regarding database:

- Populating the Brazilian LCA Database
- Several capacity building activities in the country
- SICV connection to GLAD
- But also as sponsoring partners of The Life Cycle Initiative (ABCV, IBICT, Braskem)

2. European Union

- Sector dialogues

3. Rede Ibero Americana de Ciclo de Vida (RICV; Ibero-American Network of LCA)

- Organization of CILCA and LC Seminar in Latin America
- Life Cycle Inventory project (led by Chile in 2009)

4. the Swiss Cooperation

Swiss Embassy

Swiss-Brazilian Chamber of Commerce (SWISSCAM)

ecoinvent Association/SECO

Capacity building activities since 2004

Project SRI

5. Software providers

Free academic licences of LCA software: PRe Sustainability and Thinkstep

Training on LCA softwares and support for the LCM Conferences

Conclusions and recommendations

As it was presented, the LCA community in Brazil is in the public, private, academia and research and civil society with several networks aiming similar goals and collaborating to each other. As a result, several LCA studies have been performed, the amount of publications is increasing, there are several capacity building activities, but still just few companies use LCA to create value, as shown by the small number of EPDs in the country and few public policies. Nevertheless, except from some isolated activities, there is not a mechanism that contributes for the LC database.

In this regard, it is recommended that the NDWG aims to identify a formal mechanism to improve the maturity level of the LCA database in the country. According to the evaluation of stakeholders, it is recommended that the NDWG is composed of at least one representative of each of the following organizations, preferable those listed in brackets, which were selected based on the contribution to LCA in the country, the representativeness of a group (ABCV, Rede ACV, ACV de A a Z) and the contribution to the PBACV (IBICT and Inmetro, as coleaders) and as leader of Inventory Technical Committee (Embrapa):

- ABCV (Prof. Dr. Gil Anderi)
- IBICT (Dr. Tiago Braga)
- Embrapa (Dr. Marilia Follegatti)
- Inmetro (MSc. Regiane Brito)
- Rede ACV (Luiz Gustavo Ortega)
- Academia (ACV de A a Z)

By inviting them, a suggestion of other names is possible, but keeping the NDWG with 10-12 participants.

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Appendix A - List of stakeholders

Sector	Stakeholder	Involvement	Contact established
Public	IBICT	direct	Yes, [Tiago Braga, manager of SICV]
	Inmetro	direct	No*
	PBACV	direct	No
Industry/private	Rede ACV	direct	No*
	CNI	direct	No
Academia and research	UFC	direct	No
	UFPI	direct	No
	UESB	direct	No
	UESC	direct	No
	Unesp	direct	No
	UFGD	direct	No
	UFRJ	direct	No
	UFSC	direct	No
	UFRGS	direct	No
	Unicamp	direct	No
	UnB	direct	No
	USP	direct	No
	UTFPR	direct	No
	UnB	direct	No
	USP	direct	No
	UTFPR	direct	No
	CETEA	direct	No
	CTBE	direct	No

	Embrapa	direct	No
	RAICV	direct	No
	GTACV-S	direct	No
	IPT	direct	No
	ACV de A a Z	direct	No
Others	ABCV	direct	No*
	SMAB (Municipality Secretary of Food Supply)	indirect	No
	CETESB (Sao Paulo Environmental Protection Agency)	indirect	No
	FEE	direct	No
	Fundação Vanzolini	direct	No

Appendix B - Stakeholder engagements

The stakeholder engagement will take place in three times (activities 2.3, 3.1 and 4.3 in the detailed project plan for Brazil).

2.3 Raising awareness and formation of the NDWG

The first step is to form the NDWG, by sending invitations to them and receive the written acceptance to be part of the NDWG. This working group will be formed during January in order to begin the activities in early March (due to summer vacation, this is the best date to begin activities in Brazil). Later on, to align the activities of the team, a face-to-face meeting of the NDWG is planned, depending on the availability of the members.

At first, a brief opening with introduction of participants and explanation of the activity will be presented. Then, a brainstorming activity with post-its will be set up, in which each participant will add ideas for improving the contribution of stakeholder for the maintenance of SICV (infrastructure and datasets development, review and update) in three different topics: capacity building, funding and uptake of LCA in decision making (both public and private).

Then explanation of each idea and grouping will be performed and compared to the baseline assessment. Then, the baseline assessment will be adapted according to the results of the brainstorming of the NDWG by including items that have not yet been raised and, in the case of deleting any item, a justification will be included.

To close the session, the next steps will be presented. The NDWG will be split in three team, one for each topic. Information to support defining the objectives and targets will be collected for the next meeting. It is recommended to define the timeframe of the roadmap.

3.1 NDWG interactions, further stakeholder consultation activities

The second meeting will take place one month after the first meeting, virtually. Each team will present their findings and the suggestion for the objectives and targets. With this information, a schedule will be proposed. Then, the last step will include the collection of possible mechanisms to support each activity.

The last meeting will take place one month after the second meeting, also virtually. Each team will present their findings on mechanisms and an action plan will be defined, including risks evaluation. It is recommended that each representative discuss among the network represented by him/her and bring the contributions back to the NDWG.

4.3 Dissemination activities/events

The plan of action will be presented for the Brazilian LCA Community during the Brazilian LCA Forum and comments will be gathered. Then a face-to-face meeting of the NDWG back to back to the Forum will identify which suggestions need to be included in the final version of the roadmap. Venue and technical support for the event will be provided as in-kind contribution.

Appendix C – National LCA Publications (non exhaustive)

- RODRIGUES, WHANDERSON SANTOS ; MAUAD, JULIANA ROSA CARRIJO ; VOGEL, EVERTON ; SABBAG, OMAR JORGE ; RUVIARO, CF . *Sustainability and technical efficiency of fish hatcheries in the STATE of MATO GROSSO do SUL, Brazil. AQUACULTURE*, v. 500, p. 228-236, 2019.
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