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

Deliverable D 2.5a Report on baseline assessment and stakeholder mapping in Ecuador

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# Life cycle assessment (LCA) in Ecuador

## Introduction and background

In 2012, the consideration by the Ecuadorian government of Life Cycle Thinking to play a principal role in the definition of sustainable policies on energy efficiency led to the approval of the project "LCA of Ecuadorian Electricity Generation", funded by the National Secretary of Planning and Development. Two years later, efforts to disseminate Life Cycle Thinking and coordination between the different actors crystallized in the creation of the Ecuadorian Life Cycle Network, with decisive support from the international community. The network was launch in April 2014, as a result of the International Seminar of Life Cycle in Ecuador "Life cycle approach for sustainability assessment: identifying priority policies and methodological frameworks of implementation", with support provided by the Life Cycle Initiative and the Iberoamerican Network of Life Cycle (RICV). Following the Guiding Principles for Life Cycle Networks provided by the Life Cycle Initiative, an organisation was selected as key focal point for the network (the National Institute of Energy Efficiency and Renewable Energy) and the participation from the LCA and non-LCA community was encouraged, representing a wide range of stakeholder groups. It is remarkable that, from the beginnings, all the activities developed (mainly discussion workshops and presentations) were very well-attended and received, demonstrating interest and appetite for life cycle approaches. This included the GIZ-funded workshop “LCA of biomass-based energy systems" in October 2013, the workshop of LCA and carbon footprint organized by the Ministry of Electricity in October 2014, the following presentations of the project "LCA of Ecuadorian Electricity Generation" organized by the national network in Quito and Guayaquil, etc.

Nowadays, the Escuela Superior Politécnica del Litoral (ESPOL) is the key focal point for the network, mainly integrated by the academia community in LCA and public institutions.

## LCA in industry and the private sector

Engaging the private sector is still one of the biggest challenges in Ecuador: the jump from academia to industry is yet to be achieved. The private sector has not incorporated Life Cycle Approaches in practical applications; there is a serious lack of Ecuadorian business case studies which could be used to spread the word.

Negocios Industriales Real S.A (NIRSA) was involved in the assessment of Ecuadorian processed tuna, providing information of their dedicated sub-fleet and fish processing plant (NIRSA owned and operated 13 purse seiners, which supplied 46–50 % of tuna intake for the years 2012 and 2013). Life cycle inventories were compiled and published (Avadi et al. 2015), but the role of the company was limited to "data sourcing" and no further LCA activity has been developed since then.

More recently, Ingeniería Frugal, a small innovative Engineering company, used LCA to communicate the environmental benefits of "*Just in fibers*", a proposal of sustainable

construction material presented to the 2018 Urban Entrepreneur Challenge organised by Socialab.

## LCA in regulations and public policy

Although the application of life cycle approaches for assessing sustainability has been recognized as a strategic objective for the country, government initiatives have not been consolidated, essentially due to the lack of coordination (i.e. the participation on Sustainable Public Procurement and Eco-Labelling project (SPPEL) was led by the Secretary of Public Procurement, which was selected as the project coordinator in Ecuador, with little interaction with the Ministry of Environment) as well as the lack of funds to proceed. It is remarkable that the Ministry of Environment has been discussing and trying to promote the incorporation of life cycle thinking in existing relevant policies, programmes and strategies, such as the certification scheme of sustainable construction "Punto Verde".

## LCA in research and academia

Ecuador has an emerging research community in LCA. The research activity of the network members has been focused on the energy and industry sectors; most of the contributions are related to the environmental performance of construction and electricity (main publications are listed in dedicated section). Figure 1 provides an overview of the areas of scientific research based on the published work. Life cycle assessment and carbon footprint pilot studies has been also conducted for raw cane sugar and wood products (not published). Funds provided for technical cooperation programs as well as national public research programs are the main source of LCA research funding.

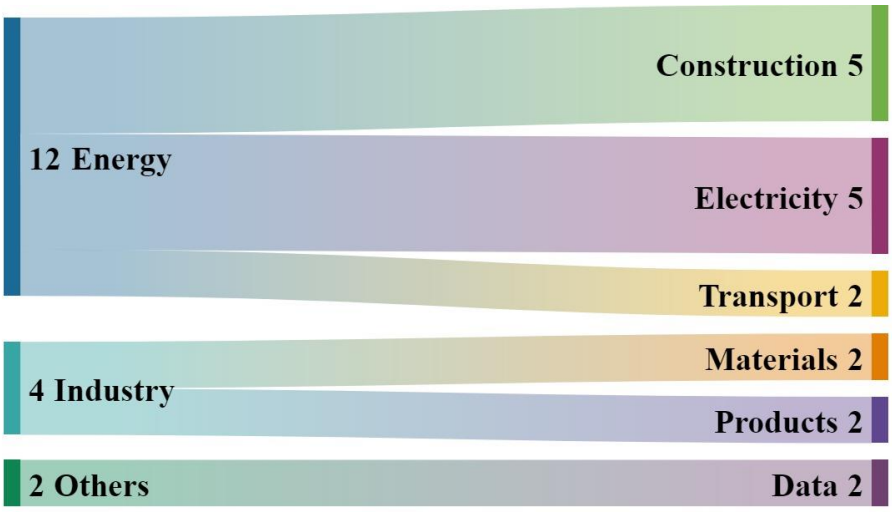


**Figure 1**. Areas of scientific research in Ecuador based on Scopus publications (2014-2018).

The two public and recognized technical universities, Escuela Superior Politécnica del Litoral (ESPOL, located in Guayaquil) and Escuela Politécnica Nacional (EPN, based in Quito) are the

leading academic institutions. Both entities have incorporated LCA in the curriculum of postgraduate programs; in particular, the Master Programme in Industrial Ecoeficiency (ESPOL) and the Ph.D. Program in Technology Management (EPN) have recognized the great potential of LCA as a development tool. Moreover, there are other institutions such as the Universidad Técnica del Norte or the Universidad Politécnica Salesiana which have started to introduce LCA concepts in undergraduate degree programs.

Last but not least, the National Institute of Energy Efficiency and Renewable Energy has also played a key role from the early stages of the introduction of life cycle approaches in the country. Nowadays, the Institute is going through a merger process with the National Institute of Mining and Metallurgy to form a new institution.

## Status of LCA in international cooperation and NGOs

Ecuador is one of Germany's development cooperation partner countries, meaning that there is a programme of close cooperation based on intergovernmental agreements. This cooperation focuses on environmental protection and the conservation of natural resources, and on public administration and economic reforms. has been working in Ecuador since 1962. The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH-had already promoted the introduction of LCA before the creation of the Ecuadorian LCA network, funding activities such as the workshop “LCA of biomass-based energy systems".

WWF’s work in Ecuador, aligned to the organization’s three central objectives (biodiversity conservation, sustainable use of renewable natural resources and reduction of contamination) has not been directly applying life cycle approaches, but the organisation has continually expressed their interest in LCA topics.

The NGO Conservación Internacional Ecuador, which works with governments and companies - including those with a big impact in sectors like mining, energy and agriculture - to promote sustainable practices, has no previous LCA experience, but has identified LCA as the key tool to be used by decision makers in both the public and private sector for the development of policies and products. Thus, the organisation has joined the consortium of the present project.

# National LCA data

## Capacity for collection and management of LCA data

On the basis of the experience acquired as a result of their research work, LCA researches of the Escuela Superior Politécnica del Litoral and Escuela Politécnica Nacional have the capacity for collection and review of LCA data, but they have not been involved with dataset management. There has not been any training activity concerning global guidance for databases creation and management.

## LCA data collection and availability

In the framework of the project "LCA of Ecuadorian Electricity Generation", Life Cycle Inventories (LCIs) have been created for hydroelectricity and fossil fuel and thermal generation technologies. LCI of hydropower has considered on-site measurements for primary data related to operation and construction data were collected from design reports of 14 Ecuadorian power plants (data were collected during 2 thesis of mechanical engineering). LCI of fossil based electricity generation technologies used in Ecuador included fuel oil in steam power plants, fuel oil in internal combustion engine power plants, natural gas in gas turbine power plants and diesel in gas turbine power plants. All the data related to the operation of the power plants were obtained by on-site measurements (average values for the year 2012), whereas background life cycle inventory data have been sourced from the ecoinvent database and adapted as far as possible to Ecuador's conditions. LCI of hydroelectricity remains unpublished; LCI of fossil based electricity has been recently published in Energy Policy (Ramirez et al., 2019).

The Galapagos archipelago, as symbol for the theory of evolution, has attracted the interest of the international community and there are some international research groups which have published LCA data (i.e. the LCA of ‘Jatropha for Galápagos’ pilot project whose aim is to use jatropha oil to produce electricity in the Galápagos Islands).

Avadi et al (2015) collected from a representative Ecuadorian tuna processing firm detailed operational fishery and processing data (dataset published in ecoinvent 3.5).

## LCA data needs

The process of identification of LCA data needs has been considered as a key action for stakeholder engagement in the roadmap development process. From the analysis of previous experiences, it can be concluded that most of the prioritisation exercises have had a very limited participation of the private sector. For example, the selection of priority sectors for PeruLCA, the recently created national LCA database for Peru, was established by the Peruvian Ministry of the Environment (MINAM) and agreed with the Peruvian Life Cycle Assessment Network (PELCAN). The selected sectors (hydropower, landfills and refinery products) also make sense for the Ecuadorian context, but we are convinced of the advantages of a participatory process. The Ministry of Environment will coordinate the identification of data needs related to public policy and we expect the private sector organisations to actively contribute to the discussion.

## Preceding national LCA database initiatives

After the launch of the network in April 2014, there was a first attempt aimed at developing a national LCA database. Some workshops and presentations in Quito and Guayaquil were organized and the discussion finally led to the presentation of a proposal to 10YFP CIP in June 2015: " *Wiñaypak ruray"* - which means "sustainable" in quecha languaje, in the most profound sense of remaining throughout time - was built on a strong consultation process and included partners from government, private sector and civil society (in particular, there was a key role played by the Ecuadorian Tribune of Consumers and Users Foundation as well as the Corporación Red Infodesarrollo, comprised of 35 organizations whose mission is to promote ICT for public policies). Concerning technical requirements (hosting, data quality, format and database interoperability, etc.) the proposal had the support of Brandon Kuczenski from the University of California.

The announcement of the results was expected by September/October 2015, but it was considerably delayed, which was certainly disappointing. In February 2016, the 10YFP Secretariat informed that the Ecuadorian application had not been selected for funding. The catastrophic earthquake in April 2016 moved the agenda toward recovery and reconstruction programs.

Lesson learnt from this experience is that long term goals must be accompanied by short term actions to face the risk of losing energy in the process.

# Stakeholder mapping

Potential stakeholders for the development of the national LCA database roadmap have been identified using the most common presentation style of stakeholder mapping: a matrix to represent two dimensions to capture and characterise the degree of influence and level of interests (Figure 2).

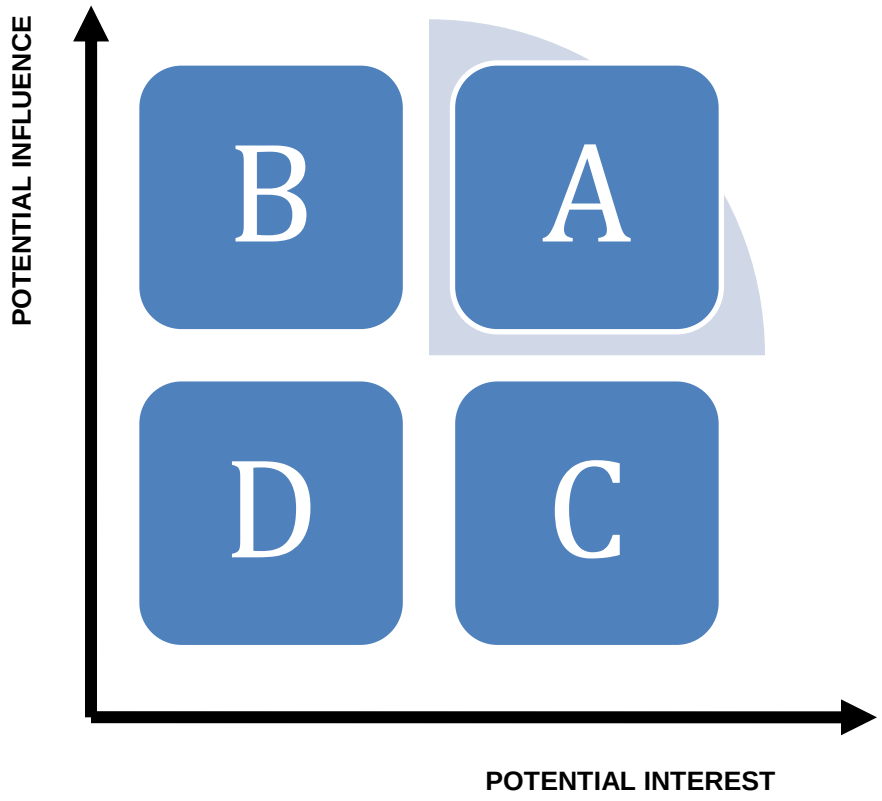


Figure 2. Stakeholder Analysis Matrix.

Stakeholders include those actors who will be impacted by the project or who could influence the outcome. This simple visual representation makes it easy to identify which stakeholders should receive the most attention:

A. stakeholders with a high potential influence and interest are "key players". They must be involved as partners or highly engaged and consult regularly.

B. stakeholders with a high potential influence but a low/middle interest must be carefully informed and consulted, trying to raise their interest and move them into the right box. The project must understand and meet their needs.

C. stakeholders with a high potential interest but low power or influence are potential supporters and ambassadors of the project. They must be informed and consulted to anticipate their needs.

D. stakeholders with a low level of influence and interest can be informed via general communications.

Based on this proposal of characterisation, the stakeholder landscape has been analysed to identify the stakeholders relevant to the project. The results of the mapping exercise are summarised in the following section, structured according to the stakeholder groups suggested.

# Stakeholder groups

## Public sector

The Ministry of Environment (MAE) is the national institution in charge of developing environmental policy and coordinating strategies, projects and programmes aimed at ecosystem conservation and the sustainable use of natural resources. Unquestionably, it is a key player, with a high potential influence and also a high interest in the project. MAE has joined the project as a partner of the consortium and will play the key role of coordinating the participation of the different government entities.

Most of the public sector stakeholders have a low or middle potential interest, with different degrees of potential influence, from middle to high. Category B stakeholders identified are the following entities:

Ministerio de Industrias y Productividad (MIPRO)
Ministerio de Agricultura y Ganadería (MAG)
Ministerio de Energía y Recursos Naturales No Renovables (MEER)
Secretaría de Educación Superior, Ciencia, Tecnología e Innovación - (SENESCYT)
Secretaría Nacional de Planificación y Desarrollo - (SENPLADES)
Servicio Nacional de Contratación Pública - (SERCOP)

Moreover, the Instituto de Investigación Geológica y Energética (IIGE) can be considered a key player for the project.

## Industry and the private sector

Ecuador's industrial sector is oriented toward primary commodities. For a long time, the economy of Ecuador depended largely on primary industries such as agriculture, petroleum, forestry, and aquaculture. Shifts in global market trends and development of technology have led to the development of other sectors such as processed food and the service sectors. However, the dependence on oil has left the country vulnerable to fluctuation in oil prices which ripples to other sectors causing an unstable economy. Industry is largely oriented to servicing the domestic market, combined with exports of oil, bananas, shrimp, metals and other primary agricultural products.

The private sector in Ecuador is an indispensable force for sustainable development, but fails to match the substance of it. There is one organisation which has been identified as a key player: Consejo Empresarial para el Desarrollo Sostenible del Ecuador (CEMDES) -Entrepreneurial Council for Sustainable Development of Ecuador-, is an organization of corporations, which was

created to promote the concept of sustainable development from the corporate perspective, and to facilitate the implementation of innovative solutions in environmental issues in Ecuador.

Two leading associations have been identified as category B stakeholders:

Cámara de Industrias y Producción (CIP)
Cámara de Industrias de Guayaquil (CIG)

There is one category C stakeholder, Ingeniería Frugal (IF), which could play an interesting role of ambassador, considering its innovative approach and success story.

### Academia and research

There are two public recognized technical universities in Ecuador, which can be considered key players as they have a potential middle/high influence as well as a very high interest in the project. Both universities, Escuela Superior Politécnica del Litoral (ESPOL) and Escuela Politécnica Nacional (EPN) are project partners.

Other academia stakeholders have been characterised as category C stakeholders, with a low or middle potential influence, but a high interest:

Pontificia Universidad Católica del Ecuador (PUCE)
Universidad de las Américas (UDLA)
Universidad Técnica del Norte (UTN)
Universidad Politécnica Salesiana (UPS)
Universidad Regional Amazónica (IKIAM)
Escuela Politécnica del Ejército (ESPE)

There are two academic networks which could play a key role for the dissemination of the results of the project:

Red Ecuatoriana de Universidades y Escuelas Politécnicas para Investigación y Posgrados - (REDU)
Red Nacional de Investigación y Educación del Ecuador (CEDIA)

### Civil society and others

International cooperation in Ecuador has been traditionally focused on environmental protection and the conservation of natural resources, but some organisations have recently moved their attention to the need of providing support for sustainable public policies. The NGO Conservación Internacional Ecuador (CI) was identified as a key actor and invited to join the consortium as project partner. CI will coordinate the participation of NGO sector, which must be informed and consulted during the process.

## Organisation of the national LCA community

As it has been previously described, the Ecuadorian Life Cycle Network, launched in April 2014, is the organisation providing the national LCA community with an "interface" for interaction and

dialogue. Nowadays the Escuela Superior Politécnica del Litoral (ESPOL) is the key focal point for the network, mainly integrated by the academia community in LCA and public institutions.

## International connections and collaborations

The creation of the Ecuadorian Life Cycle Network received a decisive support from the Life Cycle Initiative. The network maintains a connection with the Iberoamerican Network of Life Cycle (RICV) and has a strong and active relationship with the Peruvian Life Cycle Assessment Network (PELCAN), which has been providing valuable support to this project.

Angel Avadi, from the International Reference Centre for the Life Cycle of Products, Processes and Services (CIRAG) has been actively involved in the definition of the Ecuadorian proposal and has agreed to contribute in kind to the process.

# Conclusions and recommendations

Getting stakeholders genuinely engaged, which is always a key success factor, is critical for the Ecuadorian roadmap in order to increase awareness and promote the understanding of life cycle thinking by private and public decision makers. With the exception of the Ministry of Environment, government entities do not have a proper comprehension concerning life cycle approaches and the experience and knowledge of LCA concepts of the private sector is also very limited. Thus, the stakeholder analysis is the backbone of the project to ensure the sustainability of the action and the further development of a LCA national database.

The mapping is summarised in Figure 3, providing an overview of the stakeholder landscape. It must be considered that actors build a dynamic and interdependent network of relations that can evolve quickly, so this mapping exercise must be updated during the project.

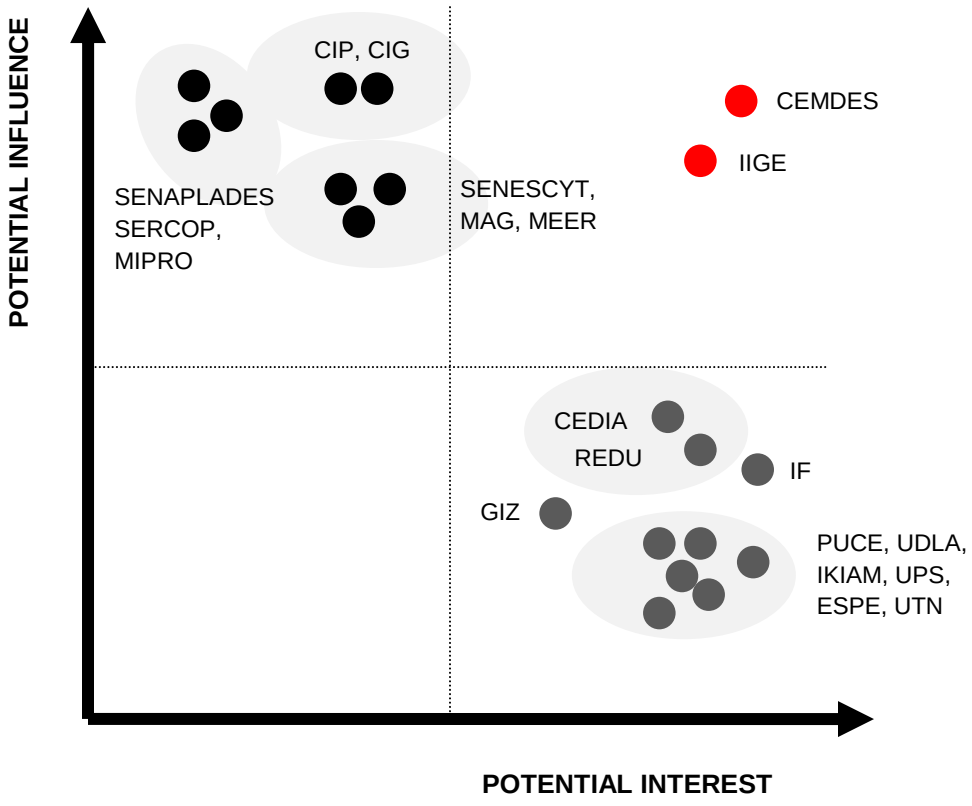


Figure 3. Stakeholder analysis for development of national LCA database roadmap in Ecuador.

The organisation of two workshops, in Quito and Guayaquil, has been established as a strategic action for stakeholder engagement. The participation of a representative from the process of development of National LCA database in Peru will provide the opportunity to discuss lessons learnt from the process of our neighbour country, but it has also de main goal to show that the development of a national LCA database is not only meaningful but also already possible for a

developing country such as Ecuador. In the coming weeks, efforts of project partners will be focused on dissemination of the project and face-to-face meetings with the associations of the private sector to receive their inputs and ensure we meet their needs. The Ministry of Environment is coordinating the participation of the public sector and will maintain face-to-face meeting with the different institutions that have been identified as relevant actors.

After the development of the workshops (5 and 7 February 2019, respectively), the National Database Working Group (NDWG) will be formally established, considering not only the relevance in terms of influence but also the interest and commitment taken by the stakeholders.

# References and resources

## JCR Journals


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## Conferences

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## Other relevant resources for the project

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Regional Stakeholder Consultation on LCA Databases in Latin America. Session on ‘Regional Roadmap towards the Development of LCA Databases’. 14 July 2015.

Regional Stakeholder Consultation on LCA Databases in Latin America Report Based on Session on ‘Regional Roadmap towards the Development of LCA Databases’. 14 July 2015.

# Appendix A - List of stakeholders

| Sector | Stakeholder | Involvement | Contact established |
|---|---|---|---|
| ***Public*** | Instituto de Investigación Geológica y Energética (IIGE) | direct | Yes. Martin Cordovez. Director |
| | -Ministerio de Industrias y Productividad (MIPRO)<br>-Ministerio de Agricultura y Ganadería (MAG)<br>-Ministerio de Energía y Recursos Naturales No Renovables (MEER)<br>-Secretaría de Educación Superior, Ciencia, Tecnología e Innovación - (SENESCYT)<br>-Secretaría Nacional de Planificación y Desarrollo - (SENPLADES)<br>-Servicio Nacional de Contratación Pública - (SERCOP) | indirect | No<br><br>[informal contact has been established and formal meetings will take place in January] |
| ***Industry/private*** | Ingeniería Frugal (IF) | direct | Yes. Mathieu Lamour. Director |
| | Consejo Empresarial para el Desarrollo Sostenible del Ecuador (CEMDES) | direct | Yes. Jimmy Andrade Executive Director |
| | Cámara de Industrias y Producción (CIP) | indirect | No |
| | Cámara de Industrias de Guayaquil (CIG) | indirect | Yes. Caterine Costa, President |
| ***Academia and research*** | Pontificia Universidad Católica del Ecuador (PUCE) | direct | Yes. Rommel Montúfar. Researcher. |
| | Universidad Politécnica Salesiana (UPS) | direct | Yes. Richard Vilches Jachson Researcher. |

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|---|---|---|---|
| | Universidad Regional Amazónica (IKIAM) | direct | Yes. Jesús Ramos, Rector. |
| | Universidad de las Américas (UDLA) | direct | No |
| | Universidad Técnica del Norte (UTN) | direct | No |
| | Red Nacional de Investigación y Educación del Ecuador (CEDIA) | indirect | Yes. Juan Pablo Carvallo, Executive Director |
| | Red Ecuatoriana de Universidades y Escuelas Politécnicas para Investigación y Posgrados - (REDU) | indirect | No |
| ***International cooperation/NGO*** | GIZ | indirect | Yes. Harald Eisenhauer. Advisor |

# Appendix B - Stakeholder engagements

Stakeholders identified by the local project team in Ecuador to play an important role for the development of a national LCA database roadmap have been listed in Appendix A. First contacts have been established with most of them (informal contacts have been established with all of them) and effective partnership has been already confirmed by 7 actors.

As it has been previously described in the conclusions and recommendations section, face-to-face meeting will be placed in the coming weeks to promote engagement and discuss the formation/representation of the NDWG, which will be finally defined after the workshops in Quito and Guayaquil (5 and 7 February).