

# 1. Introduction

Open Life Cycle Assessment (LCA) is a systematic approach used to evaluate the environmental impacts of a product, process, or system throughout its entire life cycle. It involves the comprehensive analysis of inputs, outputs, and environmental impacts associated with each stage, including the extraction of raw materials, manufacturing, distribution, use, and disposal. By considering factors such as resource consumption, emissions, and waste generation, Open LCA provides a valuable tool for decision-making and sustainable development, aiding in the identification of opportunities for improvement and the development of eco-friendly alternatives.

# 2. Description

Project nr: 2021-1-ES01-KA220-VET-000032982



**Co-funded by  
the European Union**

*This project has been funded with support from the European Commission. This publication (communication) reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.*

Open LCA (Life Cycle Assessment) is a widely used software tool for conducting life cycle assessments of products and processes. Life Cycle Assessment is a methodology used to assess the environmental impacts of a product or service throughout its entire life cycle, from raw material extraction to manufacturing, use, and disposal.

In the context of a plastic recycling project, Open LCA can be a valuable tool to evaluate the environmental performance of different plastic recycling processes and technologies. Here's how it can be used for such a project:

1. **Inventory Data Collection:** Open LCA allows you to input detailed data on the various processes involved in plastic recycling. This includes data on raw material extraction, transportation, recycling technologies used, energy consumption, and waste management.
2. **Impact Assessment:** Open LCA provides various impact assessment methods that help quantify the environmental impacts of the recycling processes. These impacts could include greenhouse gas emissions, energy consumption, water usage, and various forms of pollution.
3. **Comparison of Scenarios:** You can compare different plastic recycling scenarios using Open LCA. For example, you can assess the environmental impacts of mechanical recycling, chemical recycling, or a combination of both. This comparison can help identify the most environmentally friendly recycling approach.
4. **Sensitivity Analysis:** Open LCA allows you to conduct sensitivity analyses to understand how changes in parameters (e.g., recycling efficiency, transportation distance) affect the overall environmental performance of the recycling process.
5. **Decision Making:** The results obtained from Open LCA can provide valuable insights for decision-makers and stakeholders involved in the plastic recycling project. It can help identify hotspots in the recycling process, set environmental targets, and make informed choices to optimize the recycling process.
6. **Communication:** Open LCA results can be presented in clear, visual formats, such as graphs and charts, making it easier to communicate the environmental impacts of different recycling options to the public, investors, or regulatory authorities.

It's important to note that Open LCA's effectiveness depends on the quality and accuracy of the data input. Therefore, it's crucial to use reliable and up-to-date data for a meaningful assessment. Please keep in mind that software and tools may evolve beyond the last update, so it's recommended to check the latest version and features of Open LCA or other available LCA tools for the most current information.

## When and how to use this tool

Using Open LCA for a plastic recycling project involves the following steps:

**Define the Scope:** Determine the boundaries of your plastic recycling project. This includes specifying which types of plastic will be recycled, the recycling processes to be assessed, and the relevant life cycle stages to be included in the analysis (e.g., collection, sorting, reprocessing).

**Data Collection:** Gather data on the different stages of the plastic recycling process, including raw material production, transportation, recycling technologies, energy consumption, and waste treatment. It's essential to use accurate and reliable data for a meaningful assessment.

**Model Creation:** Input the data into Open LCA and create a life cycle model representing the plastic recycling process. This involves setting up the system boundaries, defining the functional unit (e.g., recycling 1 ton of plastic), and connecting the different processes in the life cycle.

**Impact Assessment:** Open LCA provides various impact assessment methods that help quantify the environmental, social, and economic impacts of the recycling process. These impacts could include greenhouse gas emissions, energy use, water consumption, human health effects, and more.

**Sensitivity Analysis:** Conduct sensitivity analyses to explore how variations in key parameters (e.g., recycling rates, energy sources, transportation distances) can influence the overall environmental performance of the recycling project.

**Interpretation of Results:** Analyze the results to identify hotspots, where the greatest environmental impacts occur, and potential areas for improvement. This analysis can help in making informed decisions and optimizing the recycling process.

**Communication:** Present the findings in a clear and concise manner using visualizations and reports. Effective communication of the results can help raise awareness, gain support from stakeholders, and facilitate decision-making.

Open LCA is a powerful tool that can support the evaluation and optimization of plastic recycling projects. However, it's essential to remember that life cycle assessment is just one aspect of a comprehensive plastic recycling initiative. Other factors, such as economic feasibility, regulatory compliance, and market demand, also play a significant role in the success of such projects.

## Material needed

To use Open LCA effectively for life cycle assessments, you'll need:

1. Open LCA Software (download from the official website).
2. Life cycle inventory data (default database or custom imports).
3. Computer meeting minimum system requirements.
4. Data related to the product/process you're assessing.
5. Impact assessment methods (e.g., ecoinvent) for environmental indicators.
6. Understanding of LCA methodology.
7. Interpretation and communication skills for presenting results effectively.

## Resources

Links: <https://www.openlca.org/>