

Introduction

Plastic recycling offers potential environmental advantages, such as reducing landfill and incineration rates and lowering greenhouse gas emissions and fossil resources consumption. The AD CORSSI project endeavors to automate the production of speed-bumps (SH) using recycled HDPE and glass fiber. Guided by eco-design principles and Life Cycle Assessment (LCA), our study assesses the environmental impact of this innovation compared to traditional speed-bumpers. Utilizing Methodology Guidelines on LCA and Environmental Footprint 3.1 in Simapro 9.5.0, we conduct a comprehensive cradle-to-grave

analysis. Preliminary findings indicate a reduced environmental footprint for the developed speed-bump. This poster highlights our methodology, data sources, and the significance of eco-design in promoting circularity in plastic recycling. Recommendations for optimizing the closed-loop recycling process will also be presented.

Material & Method

ULiège-PEPs conducted LCAs for four different scenarios to compare the environmental impact potential of various types of SH: concrete, rubber, polyurethane (PU) and recycled high density polyethylene (HDPE). The LCAs were conducted according to ISO 14040/44:2006 and EN 15804 + A2: 2019 standards.

The functional unit (FU) defined is the production of 1 small-sized SH of 25 kg with a lifespan of 5 years. The software used for performing the LCA is Simapro 9.5.0.2.

Goal & Scope

FU : production of small-sized truck speed bump ; 25 kg and life span : 5 years

Cradle-to-grave perspective

Database : Ecoinvent 3.9 + primary data

Software : Simapro 9.5.0.2

Environmental Footprint 3.1. (adapted) V1.00

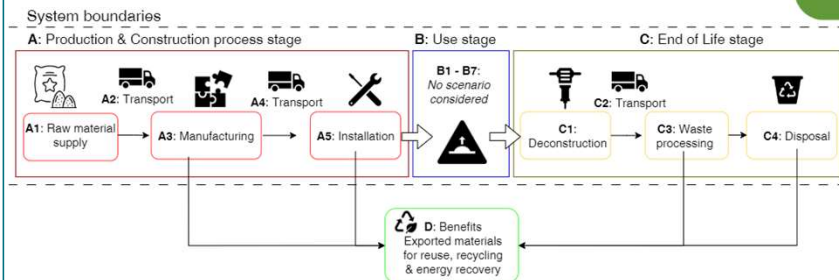


Figure 1. System boundaries according to the EN 15804 + A2 : 2019 considered for the 4 scenarios



Figure 2. Speed hump sign (on the left) and examples of speed hump in use stage

Results – Discussion

LCA was applied for comparing different kind of SH. The Figure 3 shows that the worst scenario is the production of concrete SH. It has an important impact over the five environmental impact categories evaluated.

The Figure 4 shows that the module **A1 (Raw material supply)** has a big impact over the totality of the environmental impact categories for the production of concrete SH, rubber SH and PU SH. In the case of recycled HDPE SH, the module that shows an impact over these categories is the module **A3 (Manufacturing)**.

The normalization (Figure 5) shows that the most impacted environmental category is the **resource use (fossils)** followed by the **climate change**.

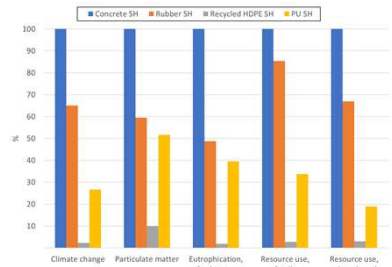


Figure 3. Comparison of the environmental impacts potential of producing a SH made with concrete, rubber, recycled HDPE and PU

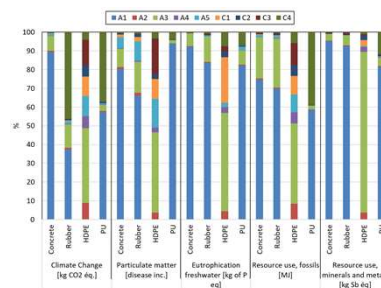


Figure 4. Characterization of the production of 1 FU

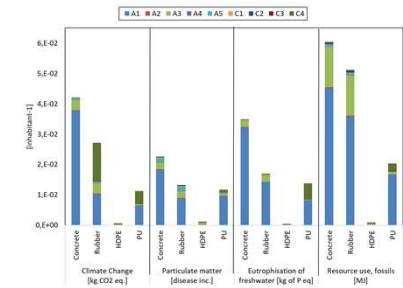


Figure 5. Normalization of the characterization of the potential environmental impacts of 1 FU

Conclusions

Life Cycle Assessment proves its value as a scientific tool to point weakness of a process or material and estimate the environmental benefits that can be done by changing the type of binder (from PU to HDPE)

Some **insights and outlooks** about this project:

- Identification of environmental hotspot: **module A3** for the project scenario and **module A1** for the other 3 scenarios.
- Partners have opted to change the binder used after receiving the preliminary LCA results

References

- [1] ISO 2006a. Environmental management – Life cycle assessment – Principles and framework, ISO 14040. Geneva: International Organization for Standardization
- [2] ISO 2006b. Environmental management – Life cycle assessment – Requirements and guidelines ISO 14044. Geneva: International Organization for Standardization
- [3] Ecoinvent, Ecoinvent data v3.9.1 : 2023 (<http://www.ecoinvent.org>)

Project and Partnership

- **3 years project funded by The Walloon Region and supported by GreenWin**

Workplan:

- **WP0 : Management and coordination of the project**
- **WP1 : Material development**
- **WP2 : Automation and product refinement**
- **WP3 - 4 : Material model development**
- **WP5 - 6 : Product design and optimization**
- **WP 7 - 8 : Digital twin of the production chain**
- **WP 9 : Techno-economic validation of the project**
- **WP 10 : LCA**

