



# LIFE CYCLE ASSESSMENT FOR INNOVATIVE BIO-BASED SOLUTIONS IN HUMANITARIAN SETTINGS

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## Introduction & Objectives

Municipal solid waste is generated wherever there are human settlements, as it is intrinsically linked to **human activity**. If this waste is not properly treated, it can pollute surface and groundwater, as well as soil, since much of this waste is not biodegradable.

**Solid waste management (SWM)** in humanitarian contexts can cause significant environmental challenges due to the often-limited resources and infrastructure available in these settings.

In this context, the EC-funded Bio4HUMAN project aims to provide humanitarian aid operators and stakeholders in the bio-based sector with a list of **bio-based solutions** for **solid waste management**, which have the potential to be applied across various humanitarian contexts.



## Materials & Methods

Bio4HUMAN envisions addressing the challenge of the **solid waste management** crisis in humanitarian contexts by developing innovative **bio-based** solutions. Potential bio-based solutions were identified through:

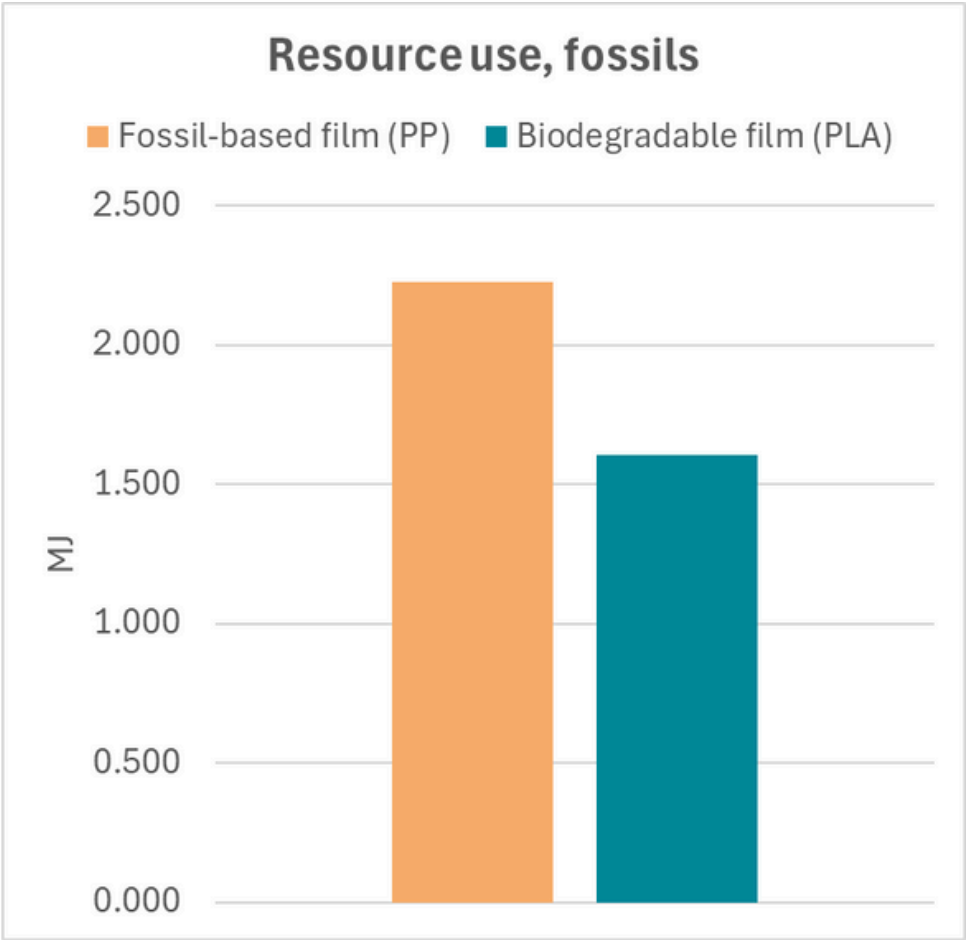
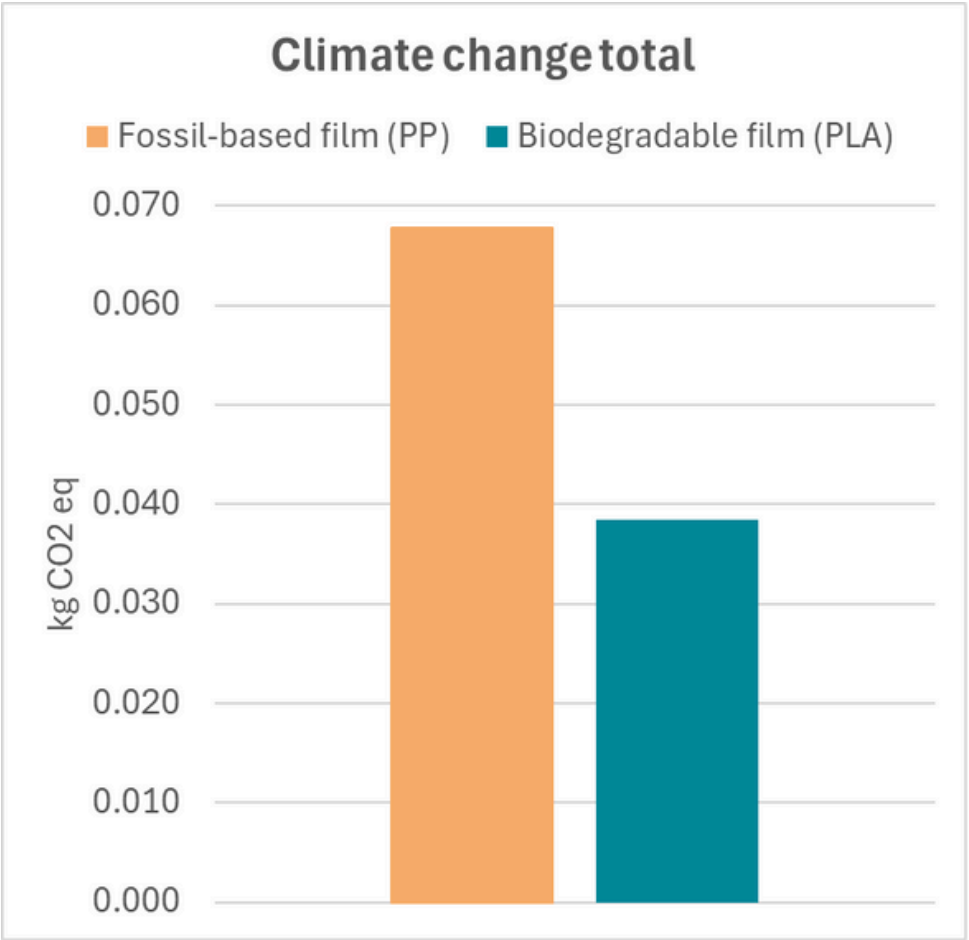
- Surveys with the Bio-Based Industry Consortium
- Literature review on humanitarian supply chains
- Interviews with humanitarian operators
- Analysis of EUIPO and EPO patent databases

To assess environmental performance of one of the solutions identified, a **Life Cycle Assessment (LCA)** was conducted following ISO 14040:2006 and ISO 14044:2006 standards. The analysis used SimaPro 9.6.0.1 software and the ecoinvent 3.10 database, applying a cradle-to-gate scope.

## Results & Discussion

The following graphs present the results obtained for the conventional fossil-based film made of polypropylene (PP), which is the reference scenario, compared to a biodegradable laminated PLA film (Bio4HUMAN's bio-based solution), both applicable in humanitarian packaging.

Two key impact categories were assessed: **climate change** (carbon footprint) and **fossil resource use**. The results compare **1 m2 (functional unit)** of both types of film. The results demonstrated a **reduction of 43% in climate change impact with the use of the biodegradable film, as well as a reduction of 28% in fossil resource use, per square metre**.



Environmental Impact per 1 m2 of film	PP	PLA	Reduction (%)
Carbon Footprint (g CO2eq)	67.79	38.44	43%
Fossil Resource Use (MJ)	2.23	1.61	28%

## Conclusions

**Bio-based solutions offer a viable and more sustainable alternative to fossil-based products in humanitarian aid operations.** The LCA results confirm that PLA film generates 43% fewer CO2 emissions and requires 28% less fossil resources per square metre than PP film.

The Bio4HUMAN project highlights the **potential to reduce the ecological footprint of humanitarian operations**, contributing to both climate goals and improved public health and environmental safety in vulnerable regions.

## References

- The Sphere Handbook. Humanitarian Charter and Minimum Standards in Humanitarian response, 2018. Link: <https://spherestandards.org/wp-content/uploads/Sphere-Handbook-2018-EN.pdf>
- Deliverable 3.3 Humanitarian Sector Needs Assessment Report Link: <https://bio4human.eu/wp-content/uploads/2024/08/D3.3-Bio4HUMAN-3.8.2024-Final-with-disclaimer.pdf>
- Home – Bio4HUMAN. Link: <https://bio4human.eu/>
- European Platform on LCA | EPLCA. Link: <https://eplca.jrc.ec.europa.eu/>
- Ecoinvent v3.10. Link: <https://ecoinvent.org/>



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