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BioLaMer

Proof of principle fly larvae biorefinery for biopolymer plastic production

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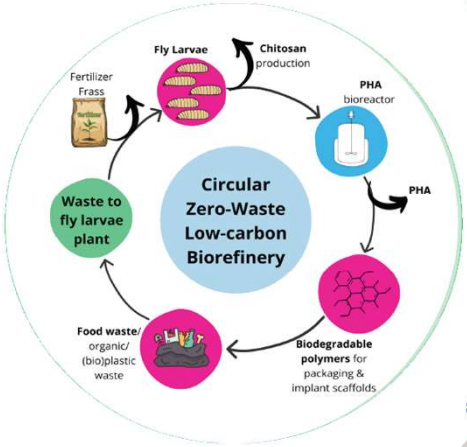
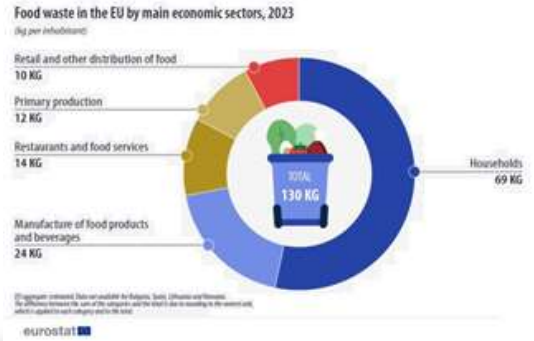
The project

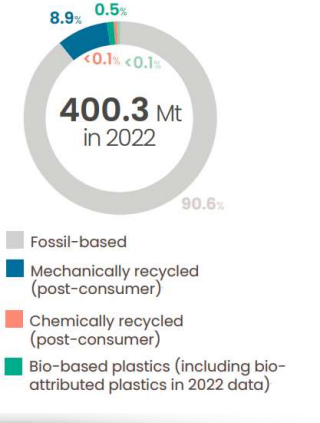
BiLaMer aims to demonstrate a novel proof of principle fly larvae biorefinery by establishing food eating black soldier fly larvae as a high impact feedstock for production of two biopolymers, and then added-value products from the produced biopolymers.

Two-fold challenge:

1. valorise food waste
2. find alternatives to petroleum-based plastics







The Team

4 Academic Institutions + 3 SMEs

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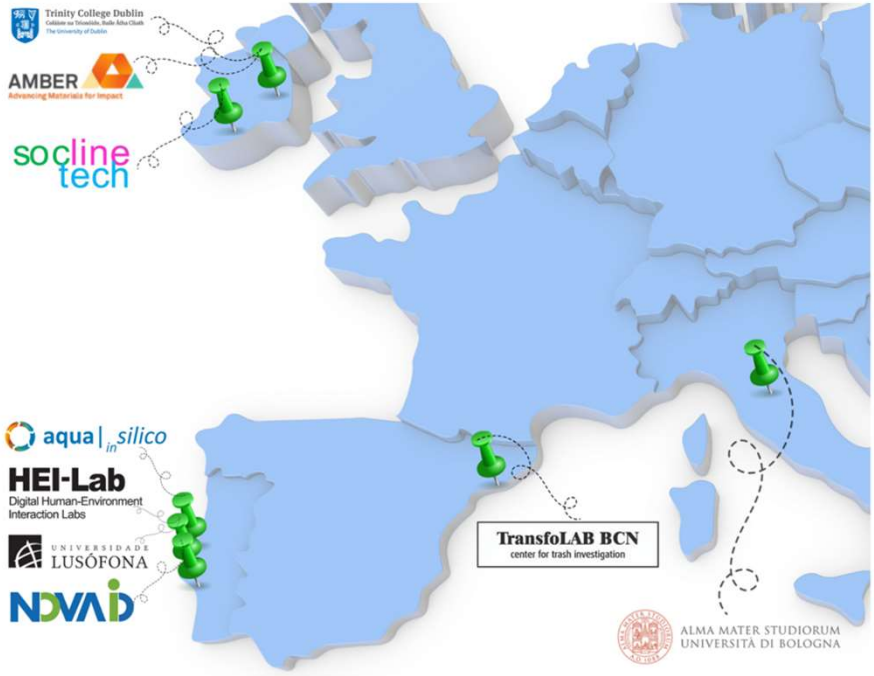
Start date 1 April 2023 End date 30 June 2026

Annual meeting held in Ravenna (April 2025)



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WPs & Project workflow

2023-2026

2.95 Million Euros

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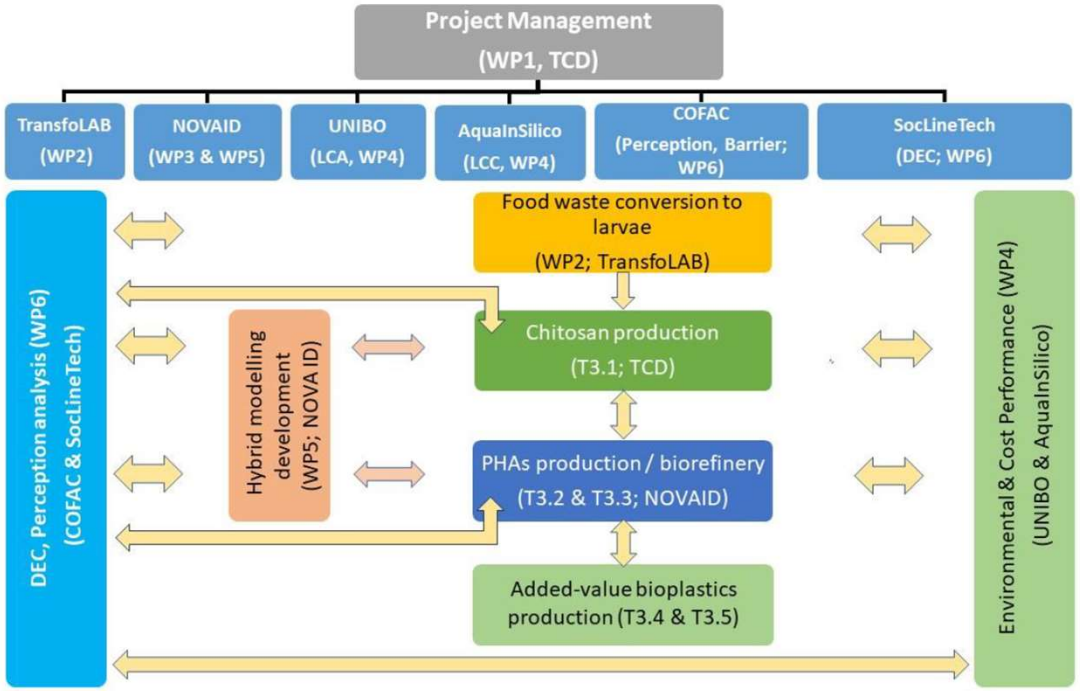

WP1: Project Management @TCD:

WP2: Cultivation of black soldier fly larvae @TransfoLab:

- Bioreactor has started production.

WP3: Biomass separation, chitosan and PHA production @TCD & NOVAID:

- All the protocols have been finalized.
- Three PHA production routes were evaluated, and single-culture was found most promising and now optimization in progress.

WP4:LCA and lifecycle costing @UNIBO and AIS

- Reviewed LCAs and LCCs for PHA and chitosan. First feedback to partners to improve environmental and economic sustainability.

WP5: Machine learning @NOVAID

- Digitization and optimization of optimal operating conditions of supercritical CO2 extraction achieved.

WP6: Market opportunities & barriers, dissemination, exploitation and communication (DEC) activities @HEI-Lab & SocLineTech

- A lack of business models and market data has been identified.
- Many DEC activities have been organized and/or attended.

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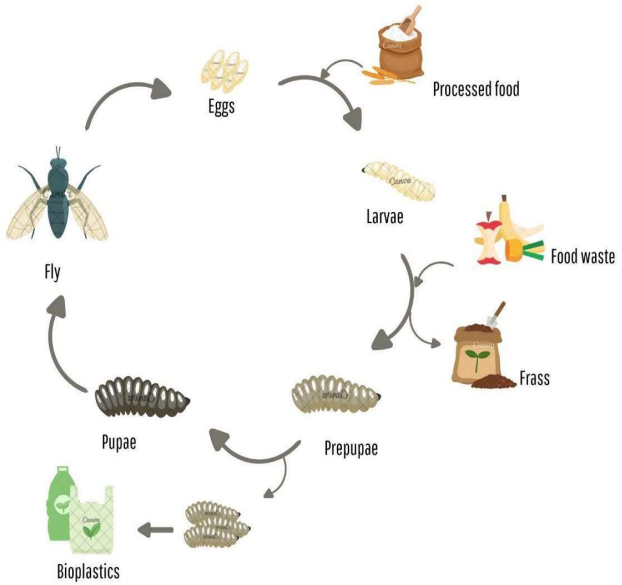
WP2: BSF larvae cultivation plant



BioLaMer BSF larvae cultivation plant (working prototype)

BSF larvae fed with food waste

WP3: Chitosan extraction

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Mill Blender Set-up

BioLaMer BSF larvae shells

Precipitate biomass without chitin

to PHA production

Chitosan extracted

- Shell & Biomass Separation
- Delipidation
- Deproteinization
- Demineralization
- Deacetylation

WP3: PHA production (single culture)

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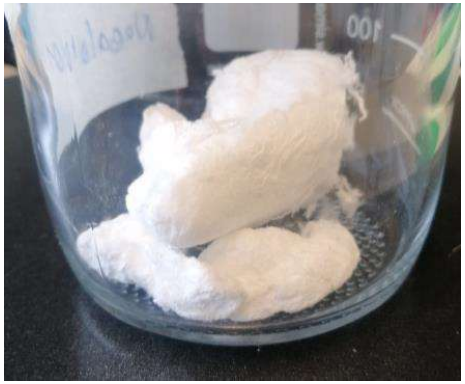
- Lipid extraction (scCO2)
- PHA production
- PHA extraction

Lipid extracted

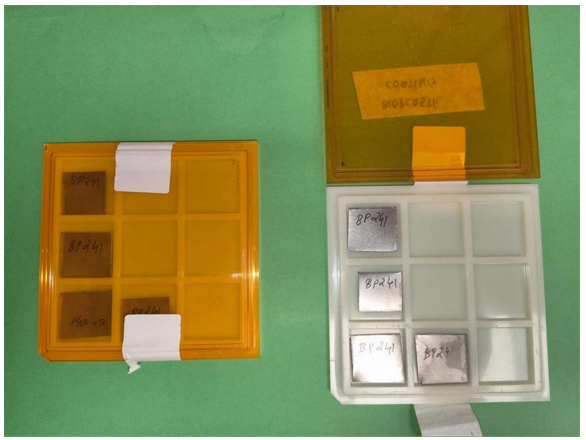
Bioreactor (2L) for PHA production



PHBV from single culture (*Cupriavidus necator*)

WP3: Coatings production

Chitosan-gelatine films (coatings on PET) heat sealed for packaging application



PHB-ethylcellulose films (coatings on titanium alloy) for scaffold medical application

WP4: LCC & LCA

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DEFINITION

Economic pillar of life cycle sustainability assessment

GOAL

Optimizing the total costs, by identifying and quantifying all the significant net expenditures

DEFINITION

Systematic analysis of the potential environmental impacts of products or services during their entire life

GOAL

Optimizing the environmental performance of BioLaMer by identifying the environmental hotspots

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WP4: LCA for Experts

sphera® LCA for Experts

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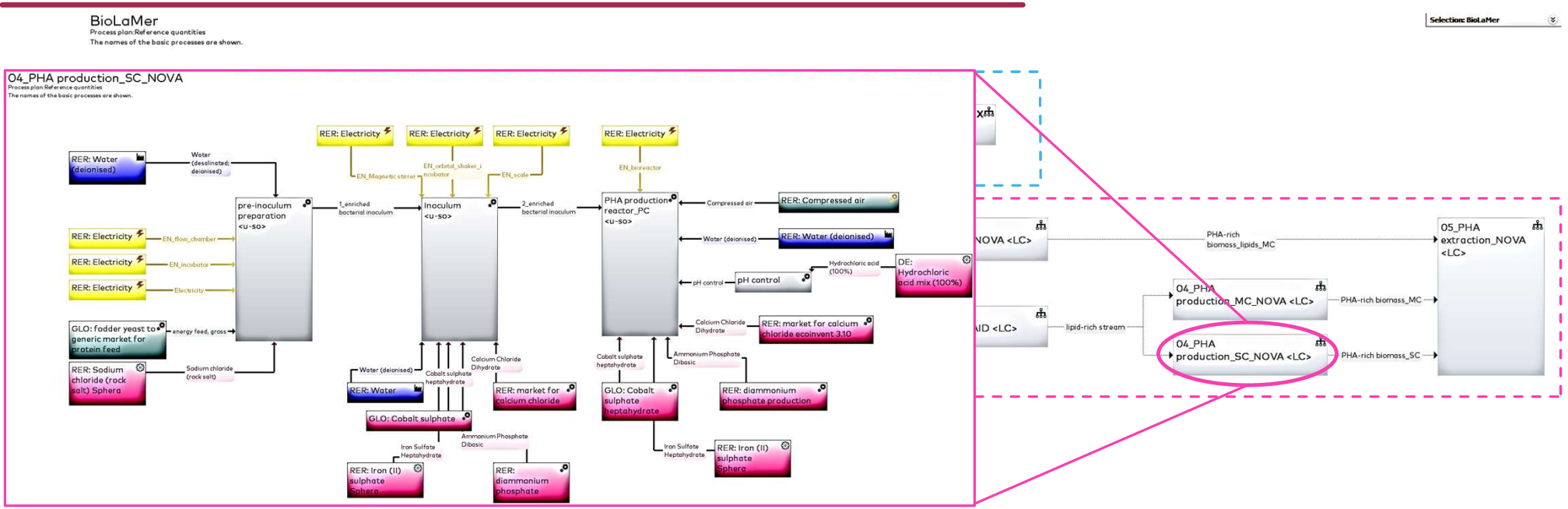

Water

Energy

Unit process

Chemicals

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WP4: screening tools for coatings

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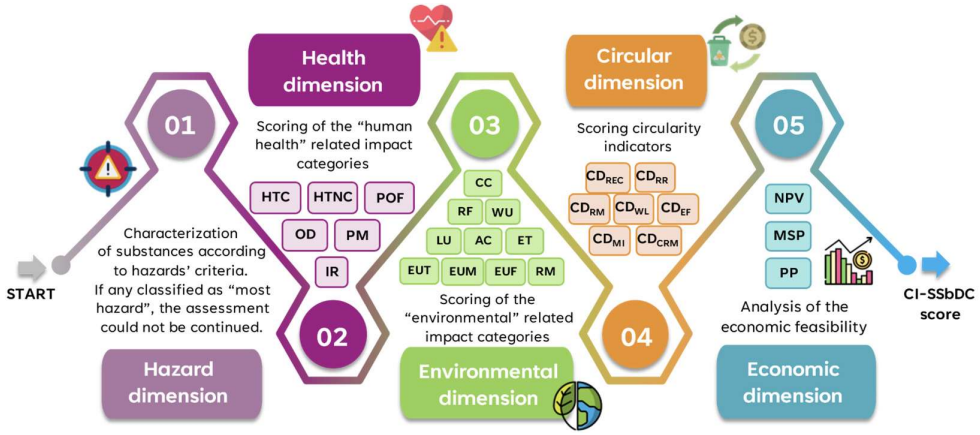
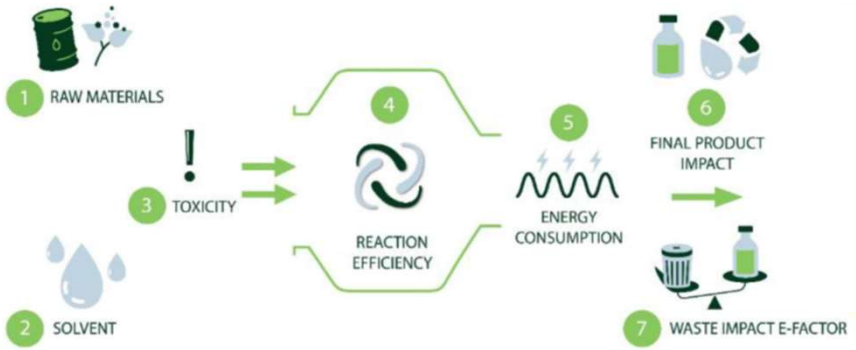


CI-SSbDC (Composite Indicator Safe and Sustainability by Design and Circularity)

Arias et al. (2024) *Sustain. Prod. Consump.*



GREEN MOTION™

Phan et al. (2015) *Green Chem.*

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Thank you for your attention!

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