Preserve Final event

upPE-T Project outcomes

Fuensanta Monzó-Coordinator

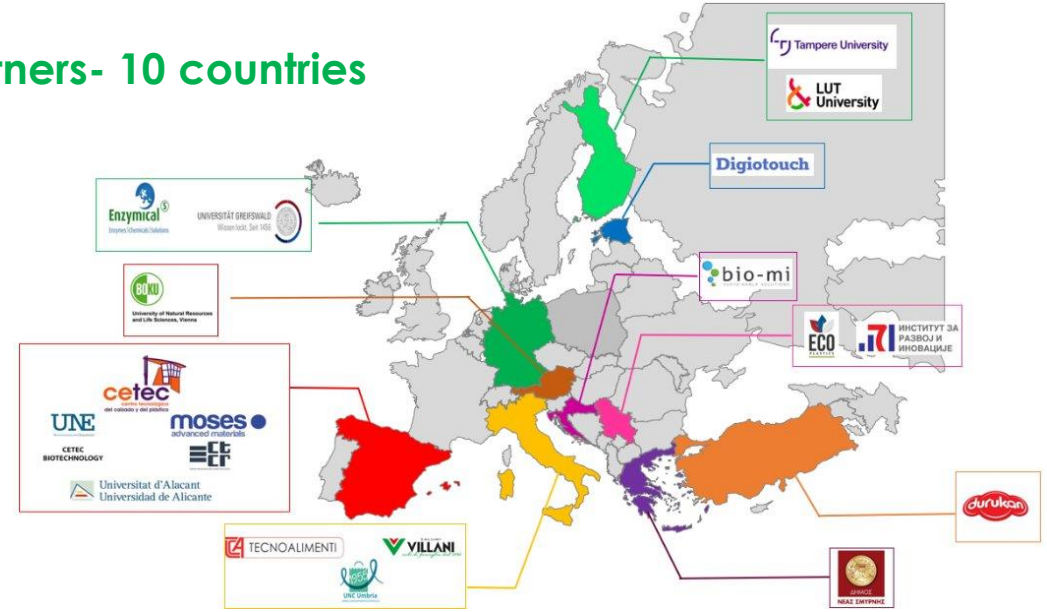
Thursday 12th December 2024

upPE-T

H2020-NMBP-TR-IND-2020-twostage
RIA
GRANT AGREEMENT: 953214

INTRODUCTION

20 partners- 10 countries



Project Information

upPE-T

Grant agreement ID: 953214

DOI
10.3030/953214

EC signature date
6 November 2020

Start date
1 November 2020

End date
30 April 2025

Funded under
INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies – Biotechnology

Total cost
€ 7 826 685,00

EU contribution
€ 7 826 685,00

Coordinated by
ASOCIACION EMPRESARIAL DE INVESTIGACION CENTRO TECNOLOGICO DEL CALZADOY DEL PLASTICO DE LA REGION DE MURCIA
Spain

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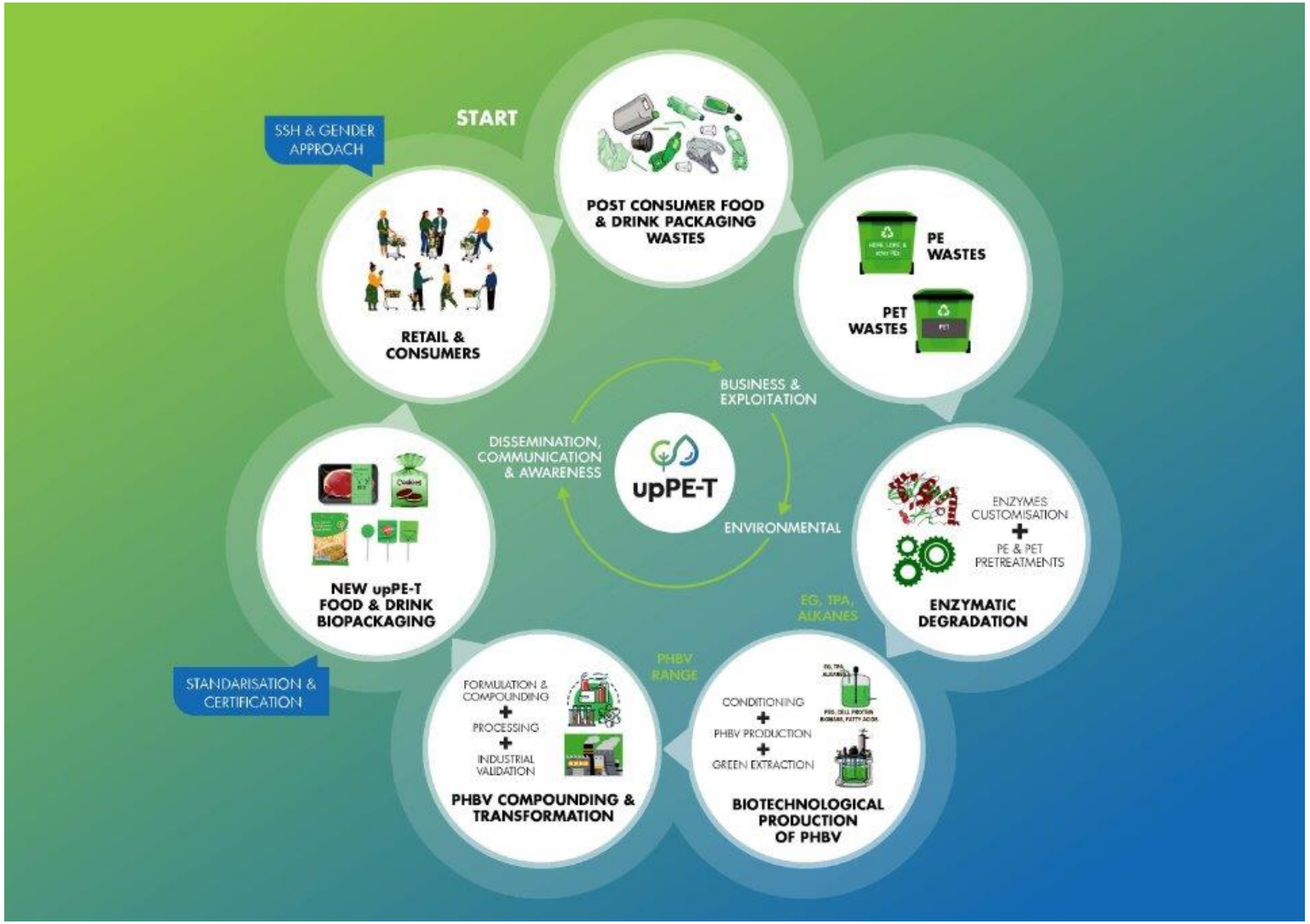
upPE-T Ecosystem



From plastic waste packaging to biodegradable packaging

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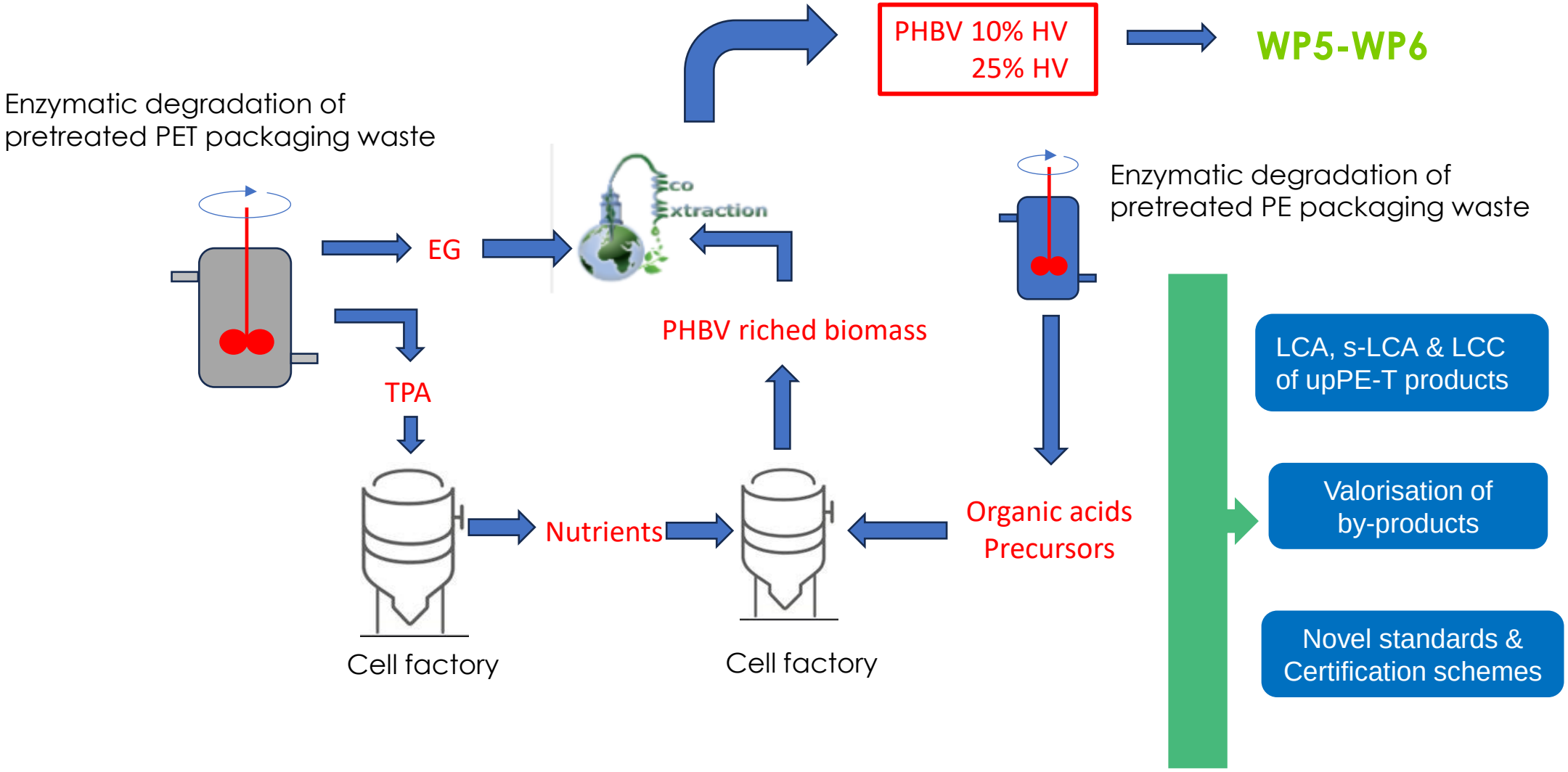
Technical WPs

upPE-T concept based on biotechnology
WP2-WP3-WP4



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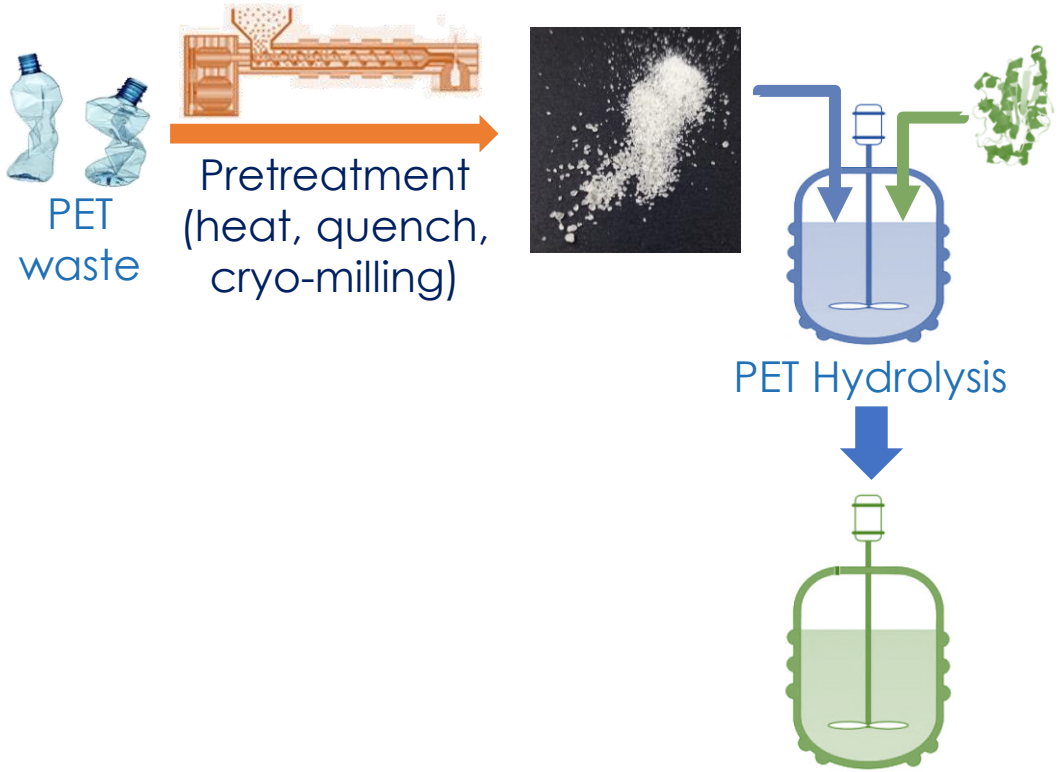
upPE-T - Streamlined process (PET)



Enzymatic degradation reaction with complete PETase fermentation broth. Keep all nutrients and degradation products for microorganisms to produce biomass and PHBV

Modulation of PHBV chemical content and properties using different feed strategies in the bioprocess
Microorganisms capable of converting TPA and EG into PHBV

Possible additional carbon source: Sugar-rich food industry waste

Microorganism-based strategies to PHBV through fermentation

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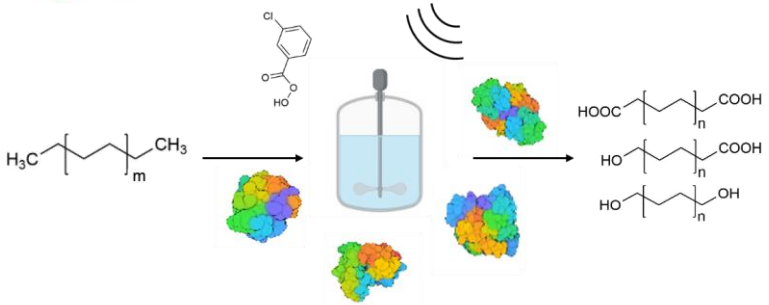
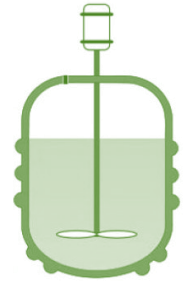
upPE-T - Chemo-enzymatic cascade (PE)



Cascade generates hydroxyacids and diacids which could be used to feed Microorganism-based strategies to PHBV through fermentation



Recent publication in Angewandte Chemie
https://onlinelibrary.wiley.com/doi/full/10.1002/ange.202415012

WILEY-VCH

COMMUNICATION

Chemo-Enzymatic Depolymerization of Functionalized Low-Molecular-Weight Polyethylene

Thomas Oiffer[a], Friedemann Leipold[a], Philipp Süss[a], Daniel Breite[a], Jan Griebel[a], Muhammad Khurram[a], Yannick Branson[a], Erik de Vries[a], Agnes Schulze[a], Christiane A. Helm[a], Ren Wei[a], and Uwe T. Bornscheuer*[a]

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Institute of Biochemistry, Dept. of Biotechnology and Enzyme Catalysis
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Walther-Rathenau-Straße 49b, 17489 Greifswald, Germany
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Surfaces of Porous Membrane Fillers, Leibniz Institute of Surface Engineering (IOM)
Permoserstraße 15, 04318 Leipzig, Germany
[d] M. Sc. M. Khurram, Prof. Dr. C. A. Helm
Institute of Physics, Dept. of Soft Matter and Biophysics
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Supporting information for this article is given via a link at the end of the document

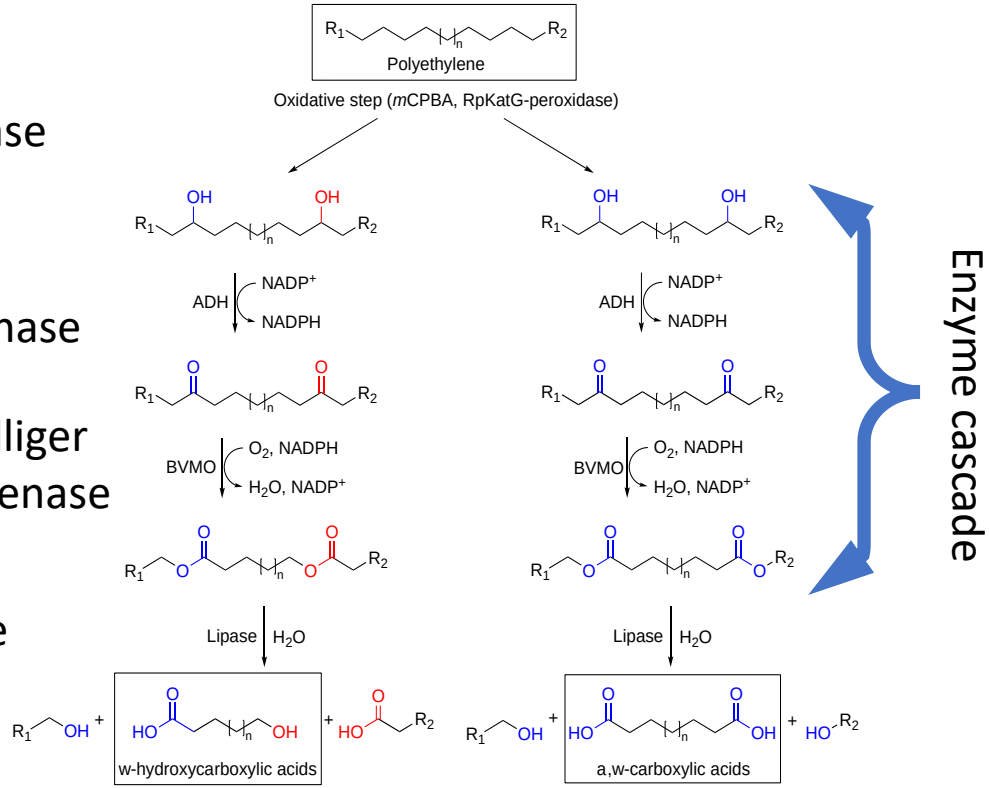
Abstract: Polyethylene (PE) is the most commonly used plastic type in the world, contributing significantly to the plastic waste crisis. Microbial degradation of PE in natural environments is unlikely due to its inert saturated carbon-carbon backbones, which are difficult to break down by enzymes, challenging the development of a biocatalytic recycling method for PE waste. Here, we demonstrated the depolymerization of low-molecular-weight (LMW) PE using an enzyme cascade that included a catalase-peroxidase, an alcohol dehydrogenase, a Baeyer Villiger monooxygenase, and a lipase after the polymer was chemically pretreated with *m*-chloroperoxybenzoic acid (*m*CPBA) and ultrasonication. In a preparative experiment with gram-scale pretreated polymers, GC-MS and weight loss determinations confirmed ~27% polymer conversion including the formation of medium-size functionalized molecules such as ω-hydroxy acids and α,ω-carboxylic acids. Additional polymer property analyses using AFM showed that enzymatic depolymerization reduced the particle sizes of this *m*CPBA- and enzyme-treated LMWPE. This multi-enzyme catalytic concept with distinct chemical steps represents a unique starting point for future development of bio-based recycling methods for polyolefin waste.

The majority of ever-produced plastics are those with non-hydrolyzable saturated carbon-carbon (C-C) backbones, such as polyolefins (polyethylene, PE, and polypropylene, PP), polyvinyl chloride (PVC), and polystyrene (PS).[1] In 2022, PE (including all low-, medium- and high-density variants) accounted for more than 26.3% of the global plastics production of over 400 million tons, making it the most abundant plastic type produced worldwide.[2] Hence, improperly disposed waste PE significantly exacerbates the plastic waste crisis through, e.g., high greenhouse gas emissions from incineration[3], the release of microplastics from agriculture mulching films[4], and landfilled waste plastics. Recent advancements in creating PE-like polymers with biodegradable properties may help to reduce the environmental impact of future plastics.[5] Consequently, it is crucial to improve recycling rates for current PE materials and to develop new degradation methods to address the environmental issues related to existing PE waste.

Current industrial depolymerization paradigms for PE and other non-hydrolyzable polymers predominantly revolve around mechanical processes.[6] However, the high costs associated with separating pure polymers from mixed plastic waste, as well as the costly chemicals and technologies required to prevent undesirable polymer degradation during the mechanical processes, are currently impeding their extended industrial practice.[6] Chemical recycling, on the other hand, offers a potential avenue for transforming PE waste into a variety of products ranging from monomers, fuels, and waxes to functionalized polymers and chemicals with added values, albeit confronted by challenges for large industrial applications such as high energy requirements and complex processing conditions.[6a, 7] The bio-based plastic circular economy has recently emerged, with a focus on the development of biocatalytic plastic recycling techniques as an alternative to the aforementioned conventional methods.[8] Biocatalytic recycling of poly(ethylene terephthalate) (PET), a plastic widely used in bottles and clothing, has been successfully commercialized as a result of nearly two decades of extensive research on the discovery and engineering of polyester hydrolases.[9] This was recently named one of the IUPAC's top ten emerging technologies in chemistry for 2023.[10] The scientific communities are currently attempting to replicate this success achieved with PET in recycling other hydrolyzable commodity plastics like polyamides (PA)[11] and polyurethanes (PUR)[12a, 12] using novel or customized biocatalysts.

Unlike hydrolyzable polymers, the inert C-C backbones of PE and other non-hydrolyzable plastics are difficult to break down with a single enzyme.[6c, 13] Since the 1990s, enzymes have been claimed to degrade PE with various chain lengths using members of peroxidases[14], alkane monooxygenases[6b], multi-copper oxidases including laccases[15], and the list has recently been extended to latex-clearing protein[17], glucose oxidase[16], cytochrome P450 monooxygenases[18], and hemocyanin-related hexamerins found in insect larvae saliva.[19] Nonetheless, many of these studies performed PE degradation using only a tiny mg-scale amount of starting materials over long incubation periods,

Oiffer et al., *Angew. Chem. Int. Ed.*, 63, e202415012



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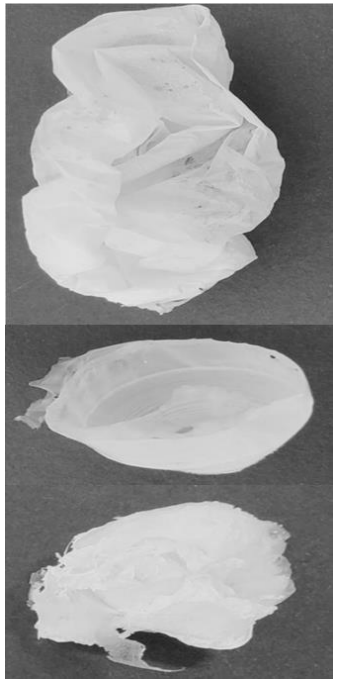
Key achievements

Waste from Candy industry

Nutrients from PET upcycling

300 L PHBV bioreactors



PHBV 10-15% HV
PHBV> 25% HV

https://www.mdpi.com/2306-5354/11/9/870

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LCA-sLCA & LCC

- ✓ LCA simplified model in openLCA
- ✓ LCC focused on the OPEX

Raw materials, chemicals	Energy	Water	Transportation

- ✓ S-LCA questionnaire have been built based on the UNEP-SETAC guidelines.

Valorisation of by-products

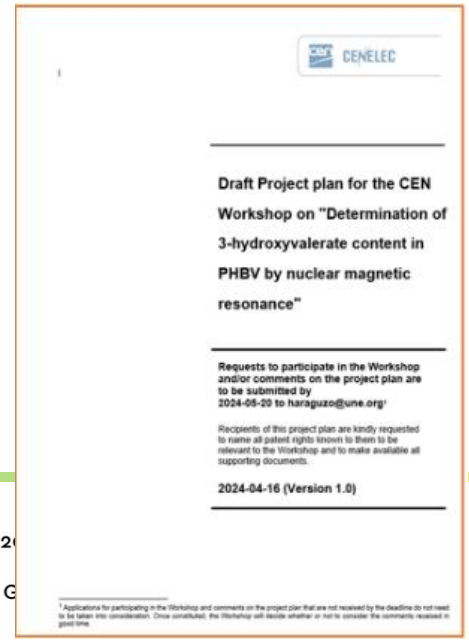
- ✓ High environmental impact hotspots identified for upPE-T processes
- ✓ Proposal of valorisation actions is being developed
- ✓ The use of renewable sources, reduction of water consumption and reuse of raw material are taking into consideration

Novel standards and certification schemes

- ✓ Contribution to standardisation: Publication of a CWA (CEN workshop agreement)

https://www.cencenelec.eu/news-and-events/news/2024/workshop/2024-04-25-phbv/

"CEN/WS upPE-T "Determination of 3-hydroxyvalerate content in PHBV by nuclear magnetic resonance"


CENELEC

Draft Project plan for the CEN Workshop on "Determination of 3-hydroxyvalerate content in PHBV by nuclear magnetic resonance"

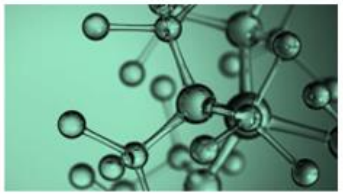
Requests to participate in the Workshop and/or comments on the project plan are to be submitted by 2024-05-29 to haraguzo@une.org

Recipients of this project plan are kindly requested to name all patent rights known to them to be relevant to the Workshop and to make available all supporting documents.

2024-04-16 (Version 1.0)

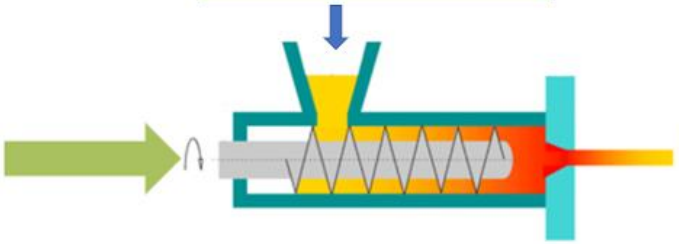
Technical WPs WP5-WP6

PHBV
+
Other components



Functionalised silica nanoparticles

Functionalised nanocellulose



Compounding

Biodegradable bioplastic with improved properties

Rigid
Semirigid
Flexible
packaging

Lollipops
sticks/envelopes
Biscuits bags
Cheese bags
Meat packaging

Processability
Mechanical properties
Plastic compounds
Barrier properties
Thermal properties

ONGOING TASKS

- Assessment of biodegradability & recyclability
- Evaluation of Shelf-life
- Validation of packaging by end-users

upPE-T

UPCYCLING BIO-PLASTIC OF FOOD & DRINK PACKAGING

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Key achievements

ROYAL SOCIETY OF CHEMISTRY

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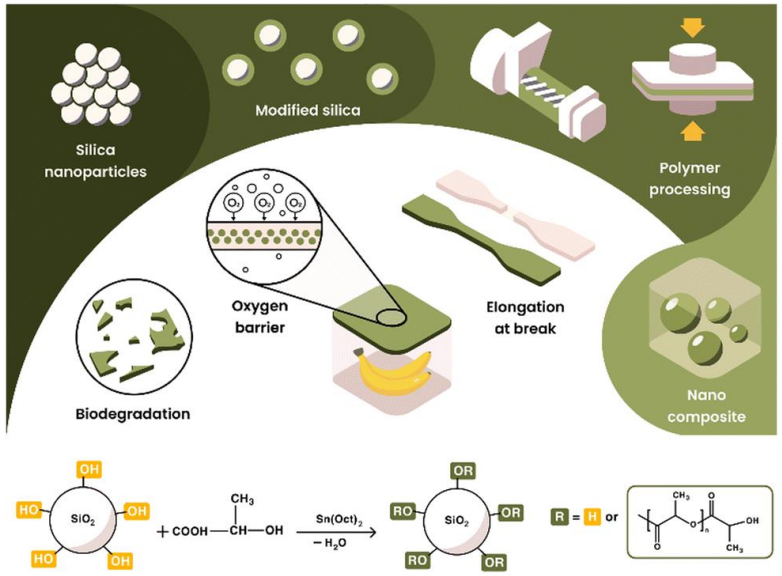
DOI: 10.1039/D4QM00206G (Research Article) *Mater. Chem. Front.*, 2024, **8**, 2754-2763

Sustainable food packaging using modified SiO_2 nanofillers in biodegradable polymers†

Mikhail Koreshkov *[a], Sebastian J. Antreich [a], Alexander Bismarck [b], Ines Fritz [c], Erik Reimhult [a], Yuuki Takatsuna [a] and Ronald Zirbs *[a]

https://pubs.rsc.org/en/content/articlehtml/2024/qm/d4qm00206g



ROYAL SOCIETY OF CHEMISTRY

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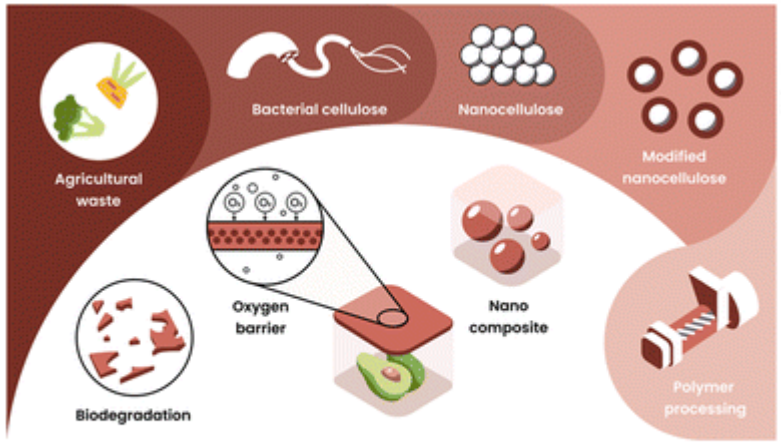
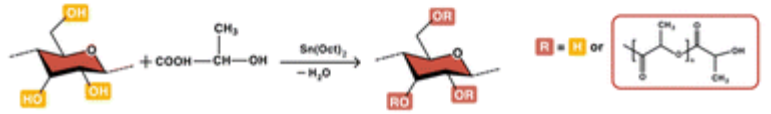
DOI: 10.1039/D4SU00168K (Paper) *RSC Sustain.*, 2024, **2**, 2367-2376

Sustainable food packaging using modified kombucha-derived bacterial cellulose nanofillers in biodegradable polymers†

Mikhail Koreshkov *[a], Yuuki Takatsuna [a], Alexander Bismarck [b], Ines Fritz [c], Erik Reimhult [a] and Ronald Zirbs [a]

https://pubs.rsc.org/en/content/articlehtml/2024/su/d4su00168k





University of Natural Resources and Life Sciences, Vienna

upPE-T

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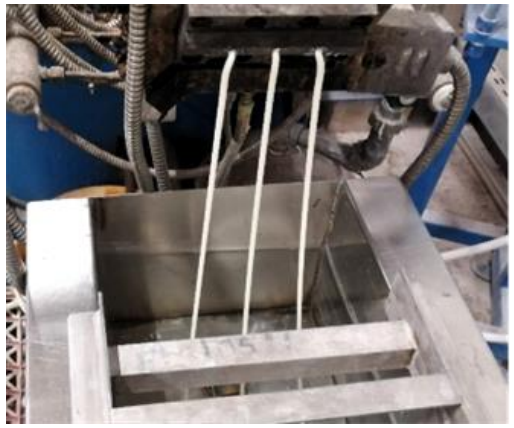
KEY ACHIEVEMENTS



Flexible blends for flexible packaging

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KEY ACHIEVEMENTS

Rigid blends for trays & sticks

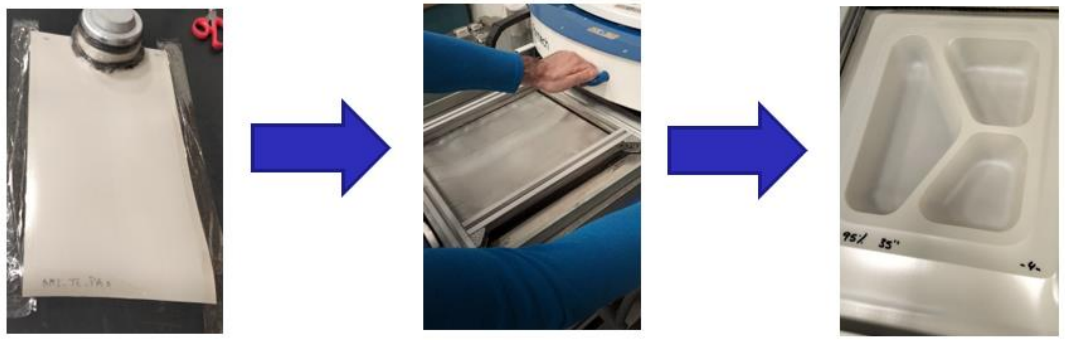
bio-mi
SUSTAINABLE SOLUTIONS

cetec

moses
advanced materials

LUT University

Tampere University



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KEY ACHIEVEMENTS- First round of validation by end users

- ✓ Sealing tests
- ✓ Appearance, texture, thickness and breakability
- ✓ Transparency

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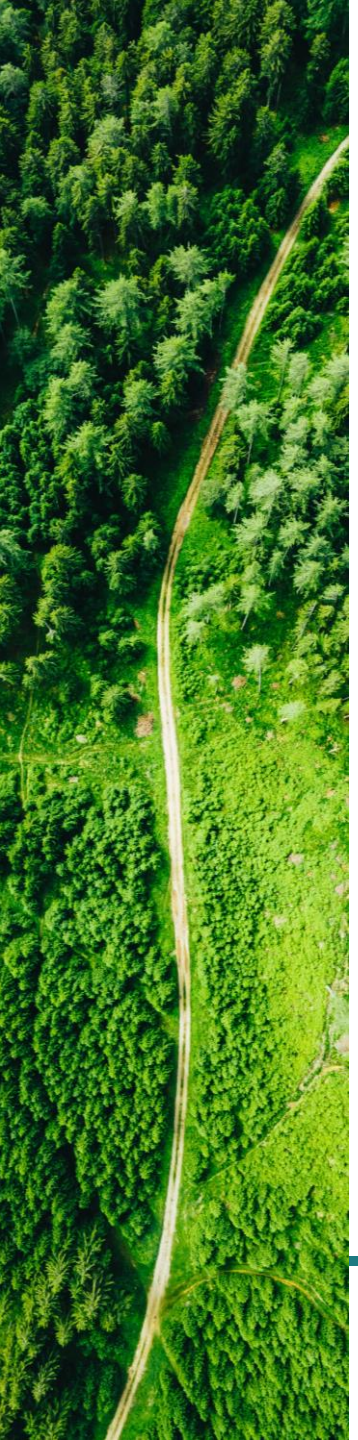

SSH& Gender Report

- ✓ Case study on Finland
  Submitted in M12 (October 2021)
- ✓ Case study on Italy
  Submitted in M24 (October 2022)
- ✓ Case study on Serbia
  Submitted in M36 (October 2023)

Comparative study
Due by M48 (October 2024)

- Legislative setting and operational aspects to the better management of plastic packaging waste for the three countries
- Preparation of policy recommendations at the country level.
- Research on behaviours and attitudes of consumers
- Research on gender-sensitive policies of recycling companies

INSTITUTE FOR DEVELOPMENT AND INNOVATION

1955 UNC Umbria
www.consumatoriumbria.it

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European Citizens Awareness enablers-ECAP

Citizens engagement and awareness **targeting young people and vulnerable groups**.
Visit to schools to promote and test ECAP, MOOC and VR

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European Citizens Awareness enablers-MOOC

https://uppet-engagement.eu/mooc

USE AND CONSUMPTION: culture of waste and consumption

Worldwide, almost 1 million plastic bottles are purchased every minute. The environmental impact of that plastic tide is a growing political problem. In this module you will learn how this problem can be contained.

Learn More

ИНСТИТУТ ЗА РАЗВОЈ И ИНОВАЦИЈЕ

1955 UNC Umbria www.consumatoriumbria.it

Beyond the R's

Current disposal methods threaten our health, safety and environment, and impose additional indirect costs on society. The solution to this problem lies in the 'Three Rs' approach: reduce, reuse, recycle.

BIO: Benefits, Information, and Observation

BIO is a part of different words and terms, and depending on the rest of the construction of the word, it can adopt different meanings. This module will explain their meanings.

Cheers! Long live planet Earth and its inhabitants

This module takes an introductory approach on overpopulation, pollution, fossil fuel, deforestation, carbon footprint, and microplastics.

Men are all the same (but so are women)

This module describes an urgent need to start building man's alliance with the environment in correct terms for a better quality of life.

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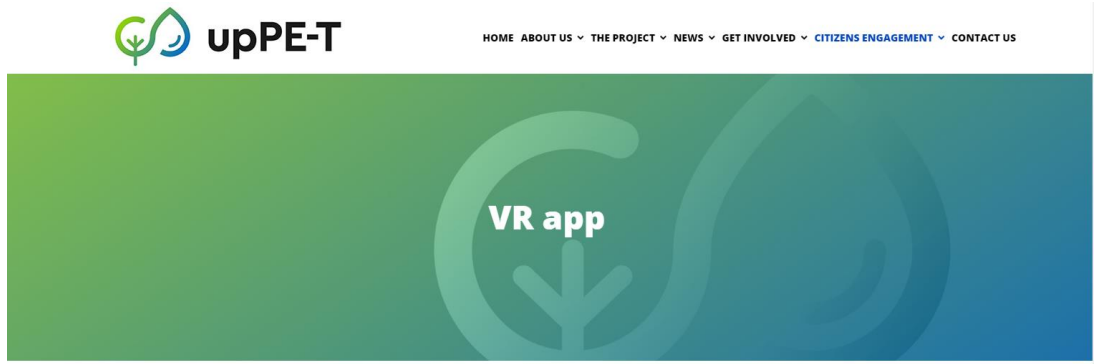
European Citizens Awareness enablers-VR app

https://uppet.eu/citizens-engagement/vr-app

Digiotouch



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Policy review

DELIVERABLE D9.16 : policy paper that will provide recommendations for policies at both the EU and national levels

Policy review at European level related to :

- The management of post-consumer plastic packaging waste for food and beverages
- Plastic packaging in contact with food
- Biobased plastic

Analysis of:

- Current policy framework
- Announced policy changes at the EU level
- Barriers for the uptake of innovative solutions

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Joint White Paper with the sister projects

https://zenodo.org/records/13862921

PRESERVE

UPLIFT

upPE-T

BIOSUPPACK

moBIOS

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THANK YOU

f.monzo@ctcalzado.org

https://uppet.eu/

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UPLIFT

sUstainable PLastIcs
for Food & drinks packaging indusTry

This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 953073.

DESCRIPTION:

- The overall idea of UPLIFT is to biologically depolymerize bio- and fossil-based plastic packaging waste and convert it into more renewable and easily upcyclable polymers, following a biorefinery approach. UPLIFT will address the full plastic packaging value chain, from monomer production to packaging material manufacturing and back to EoL reusing and recycling options.

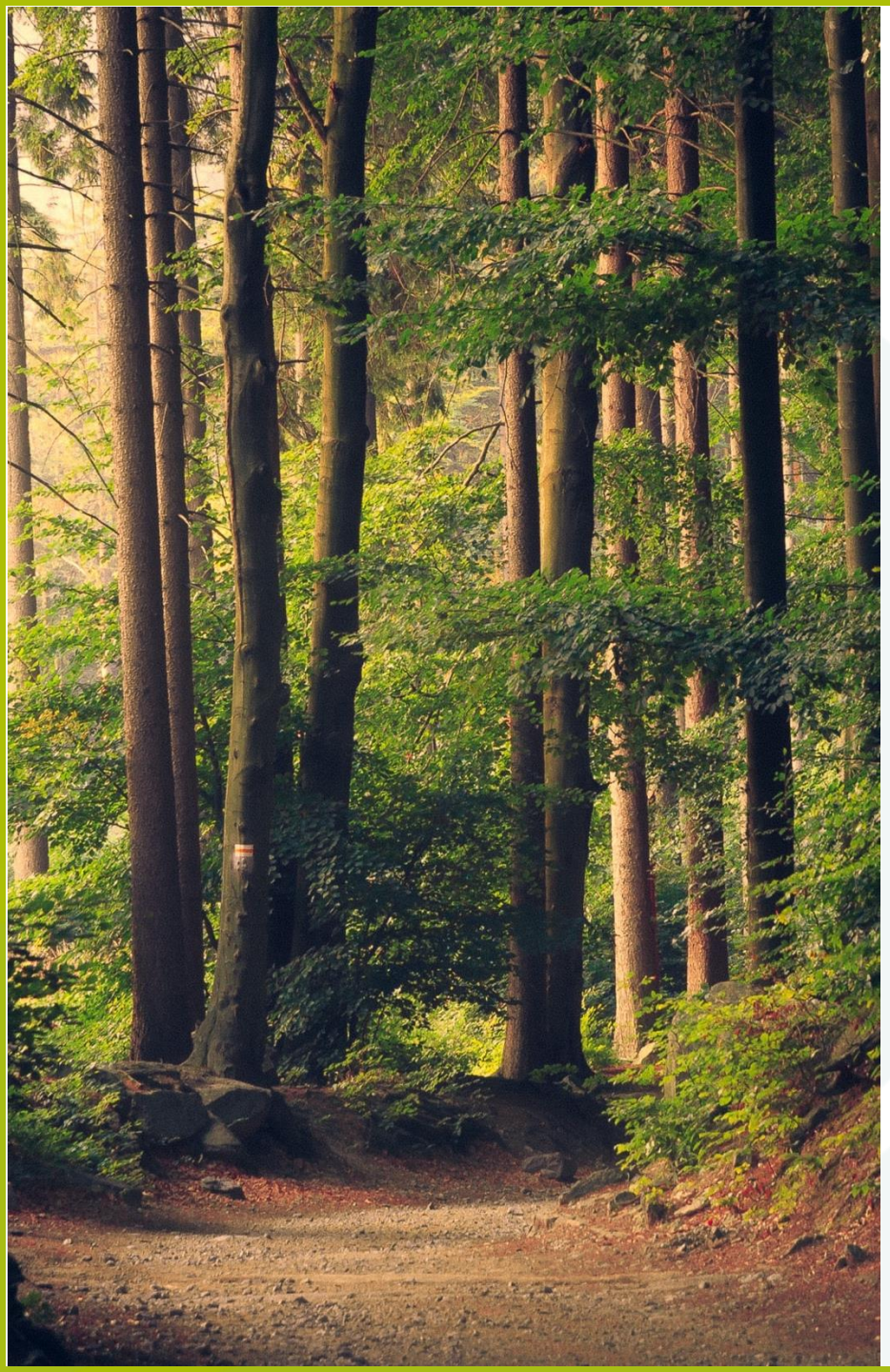
This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 953073.

IMPACTS

UPLIFT

1. Contribution to upcycle F&D packaging materials which account for, at least, 60% of the market by 2030
2. Novel standards and certification schemes to be applied
3. Delivery of novel plastic packaging solutions with less environmental impact
4. Contribution to bring the European plastic packaging industry in the forefront of innovations and sustainability worldwide

This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 953073.



OBJECTIVES

The main objective of UPLIFT is the development of a circular plastic packaging value chain in the F&D sector by applying novel eco-design strategies and biochemical upcycling technology routes.

To this end, the vision of the project revolves around two main axes:

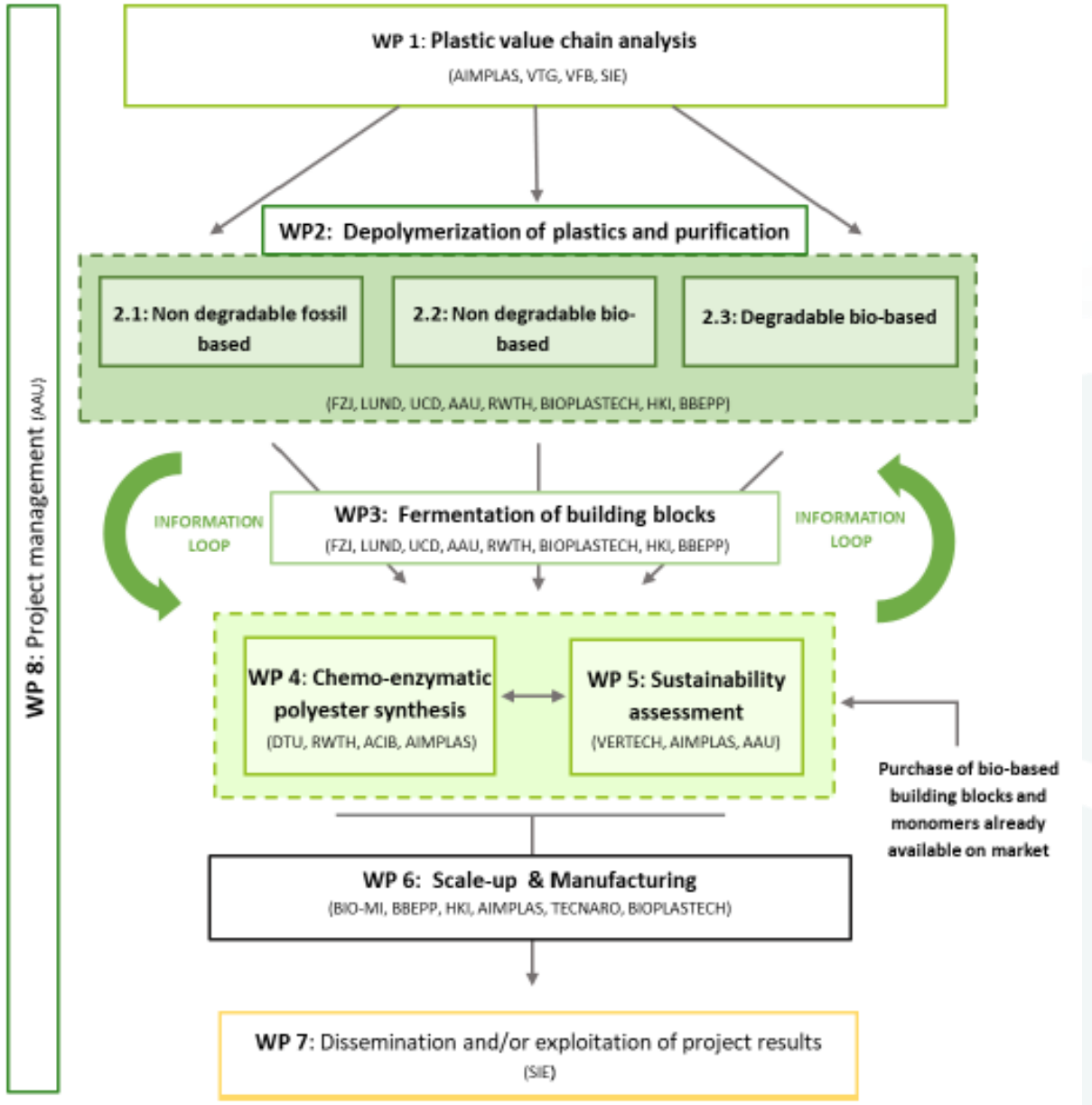
1) to combine bio-depolymerization of plastics and bio-based building blocks to obtain smarter and renewable plastic materials, which will enable the effective upcycling of plastic packaging waste streams.

2) to fully integrate the bio-chemical upcycling technologies within already existing and more mature recycling processes and fermentation processes. All these prototype materials and processes will be tested in a relevant operational scale close to expected performance (TRL 6).

This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 953073.

METHODOLOGY

UPLIFT



This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 953073.

PROJECT PARTNERS

AALBORG UNIVERSITY

JÜLICH FORSCHUNGSZENTRUM

acib austrian centre of industrial biotechnology

DTU

LUNDS UNIVERSITET

TECNARO GESELLSCHAFT ZUR INDUSTRIELLEN ANWENDUNG NACHWACHSENDER ROHSTOFFE mbH

bio-mi SUSTAINABLE SOLUTIONS

Bio Base Europe Pilot Plant

LEIBNIZ HKI

AIMPLAS PLASTICS TECHNOLOGY CENTRE

UCD DUBLIN

Bioplastech

Sustainable INNOVATIONS®

IAC Lehrstuhl für Bioanorganische Chemie | RWTH AACHEN UNIVERSITY

VESTFORBRÆNDING

This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 953073.

UPLIFT

sUstainable PLastIcs
for Food & drinks packaging indusTry

This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 953073.

Empowering The Bio-Based Sector for Solid Waste Management in Humanitarian Settings

December 12th

Carla Bartolomé-ITENE Carla.bartolome@itene.com

inquiry@bio4human.eu

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

Bio4HUMAN project fact sheet

BIO4HUMAN

- Full name: Identifying bio-based solutions for waste management applicable to the humanitarian sector
- Horizon Europe, Cluster 6, CSA
- Duration: 30M (Start: 1 Jan 2024; End: 30 June 2026)
- 10 Partners – multi-actor approach
- 9 Work packages

Enspire .science

UC UNIVERSIDAD DE CANTABRIA

Člověk v tísni

pah Polska Akcja Humanitarna

weloop

AIMPLAS PLASTICS TECHNOLOGY CENTRE

RESEARCH CENTER ITENE

Pro Civis Fundacja Edukacji i Dialogu Społecznego

IRISH BIOECONOMY FOUNDATION Growing Ireland's Bioeconomy Together

BIO EAST HUB EN

Funded by the European Union

BiO4HUMAN General objectives

- **Bio4HUMAN's overarching objective is to provide humanitarian aid operators and bio-based sector stakeholders:**
  - with science-based information on the application potential, sustainable performances, and
  - circularity of bio-based products and systems, **suitable for humanitarian purposes.**

- **The main findings of the project will be translated into**
  - a set of **guidelines and recommendations** and a
  - **replication roadmap of solutions** identified applicable to diverse humanitarian contexts

Bio4HUMAN context

- In humanitarian actions, **solid waste generated by both the affected population and humanitarian activities can accumulate quickly and in large amounts**.
- The large build-ups of unmanaged waste have clear **potential impacts on public health, livelihood, and the environment.**
- It is important to stress out that humanitarian settings are generally characterized by **poor waste management systems**
- This is usually caused by the fact that in humanitarian crises the focus of all stakeholders including local authorities and population is directed towards **basic lifesaving activities and service provided by municipal institutions and private companies is not keeping pace with the amount of waste generated.**

1. BIO4HUMAN specific Objectives

Assess the scope to which bio-based innovative technological solutions and bio-based systems have the potential to be applied under the humanitarian context

Define and catalogue needs of the humanitarian sector in SWM

Assess the scope of available different bio-based innovative technological solutions and systems

Conduct Life Cycle Sustainability Assessments (LCSA) of “go” solutions identified in South Sudan and DRC

A report that documents the process of LCA methodologies identification and includes the LCAs (containing inventory analysis, impact assessment, interpretation of results)

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1. BIO4HUMAN specific Objectives

BIO4HUMAN

Socio-economic and governance aspects & Replication potential of identified solutions

Evaluate socio-economic and governance aspects of bio-based solutions identified

Conduct feasibility study for theoretically proposed solutions in 2 African countries

Development of guidelines and recommendations

Develop a set of guidelines and recommendations for policymakers, bio-based sector actors, humanitarian aid practitioners, and the scientific community

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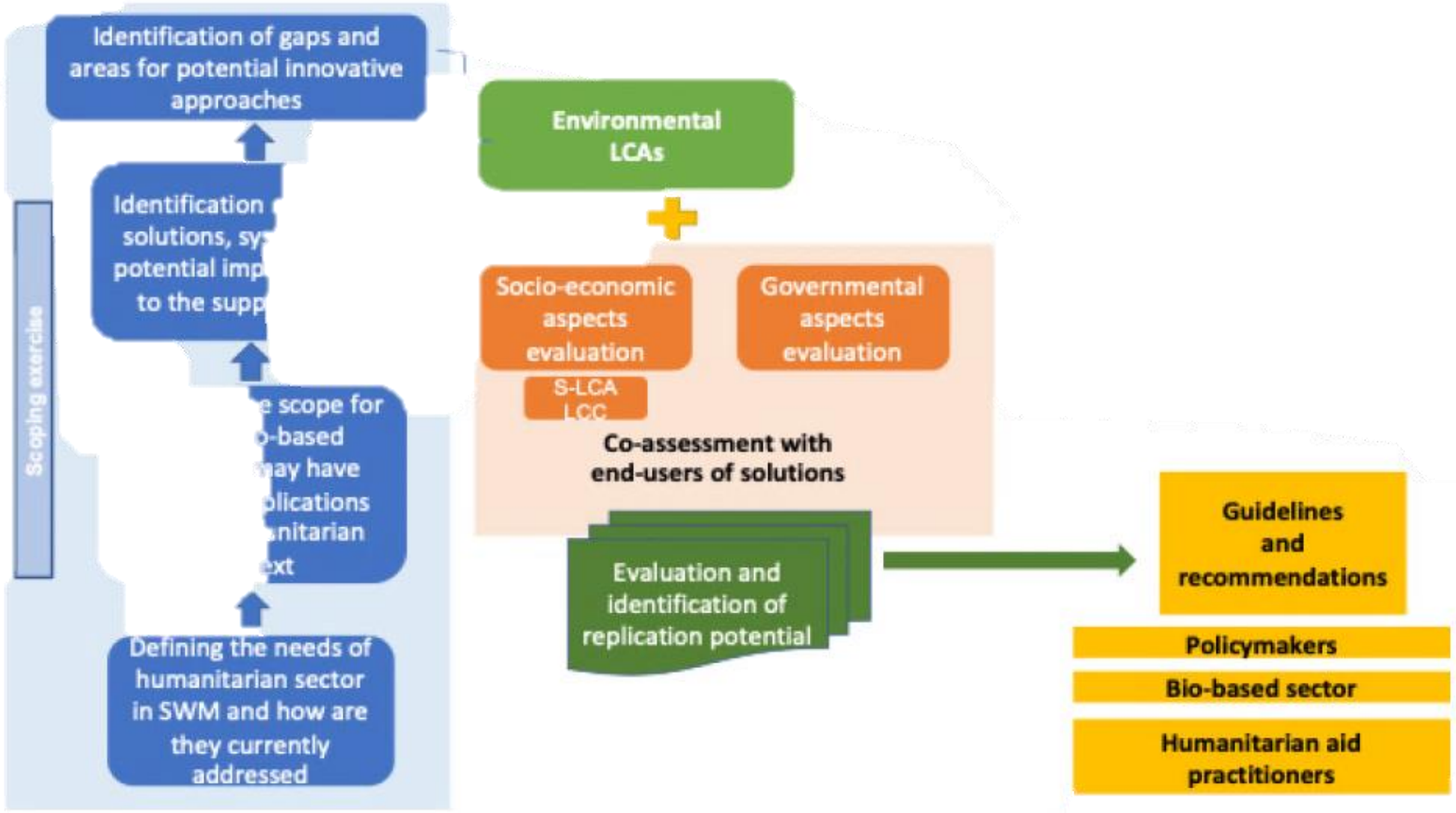
2. BIO4HUMAN Conceptual flow



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3. Needs assessment of the humanitarian sector in SWM

BIO4HUMAN

SWM challenges in the humanitarian context
Lack of SWM infrastructure and services
There is a general lack of financial resources
National policies regulating SWM either lack or are not sufficiently enforced and coordination among authorities on SWM is weak. The government does not plan strategically for SWM and often poses barriers to private SWM businesses that are trying to fill in the gap.
Lack of coordination among SWM stakeholders
Lack financial and human capacities and policies to implement Sustainable SWM
The technical capacity of all actors in SWM is low
There is a general lack of quality waste data, monitoring and research both on the side of governments, academia, private sector and HOs, which affects the understanding of the problem and searching for sustainable solutions.
Armed conflict negatively affects the SWM infrastructure and services

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3. Needs assessment of the humanitarian sector in SWM

BIO4HUMAN

Solid waste opportunities in humanitarian context
To reduce waste in humanitarian context, the preferred solution is waste prevention and reduction towards zero waste/waste minimization and circular approach given the weak state of SWM infrastructure.
The second step is the establishment of official and good quality reuse and recycling systems that can transform waste into a resource and energy.
Involve multiple stakeholders and secure funding, ideally with investment and participation from private sector to create safe and accessible disposal sites and sustainable packaging/materials, e.g. eco-design tarpaulins for emergency shelters, latrine covers, walls and fences, packaging
Establish data collection and monitoring mechanisms as well as digitalization to strengthen waste management value chains.

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3. Needs assessment of the humanitarian sector in SWM

BIO4HUMAN

Solid waste opportunities in humanitarian context- Hihglighted by reasearch participants
Prioritize sensitization of all stakeholders to change the mentality of low responsibility and increase the overall knowledge of why good SWM practices are important and their positive impact on individuals;
Build technical capacities of governments, academia, private sector and HOs to increase their ability to plan and implement good SWM
Governments need to promote and require waste segregation at household level to encourage further SWM;
Coordination among various SWM needs to be strengthened and links across the SWM chain created;
The existing research and initiatives should be supported to enable the creation and implementation of local solutions as well as the capacity growth of local academia actors

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4. What are the potential bio-based solutions created, designed and delivered by the bio-based sectors?

BIO4HUMAN

- **Bio-based products**
- **Bio-based technologies**
- **Bio-based processes**
- **Bio-based systems**
- **Bio-based innovations**

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4. What kind of bio – based products Bio4HUMAN will be looking for?

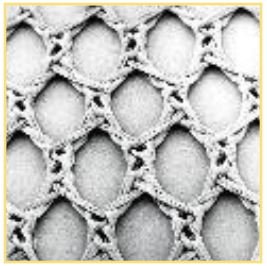
BIO4HUMAN

Bio4HUMAN is first and foremost looking for "bio – based products" which have succeeded or are about to succed in progressing from early ideas to a final product placed on the market.

Bio-based plastics

Bio-based packaging

Bio-fibers for textiles



Hygiene and sanitary products of bio-based origin

Bio-based construction materials

Bio-based lubricants

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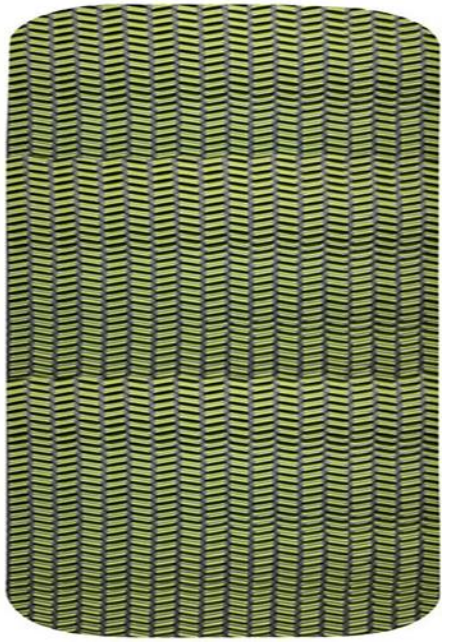
4. What kind of bio – based products Bio4HUMAN will be looking for?

BIO4HUMAN

Examples of “bio-based products” of potential relevance for the humanitarian purposes

Disposable tableware (plates, bowls, cups) derived from 100% bio-based feedstock

Wood fibre–based flexible bags



Bio-foam sleeping pads

bio-based, hard surface cleaning products

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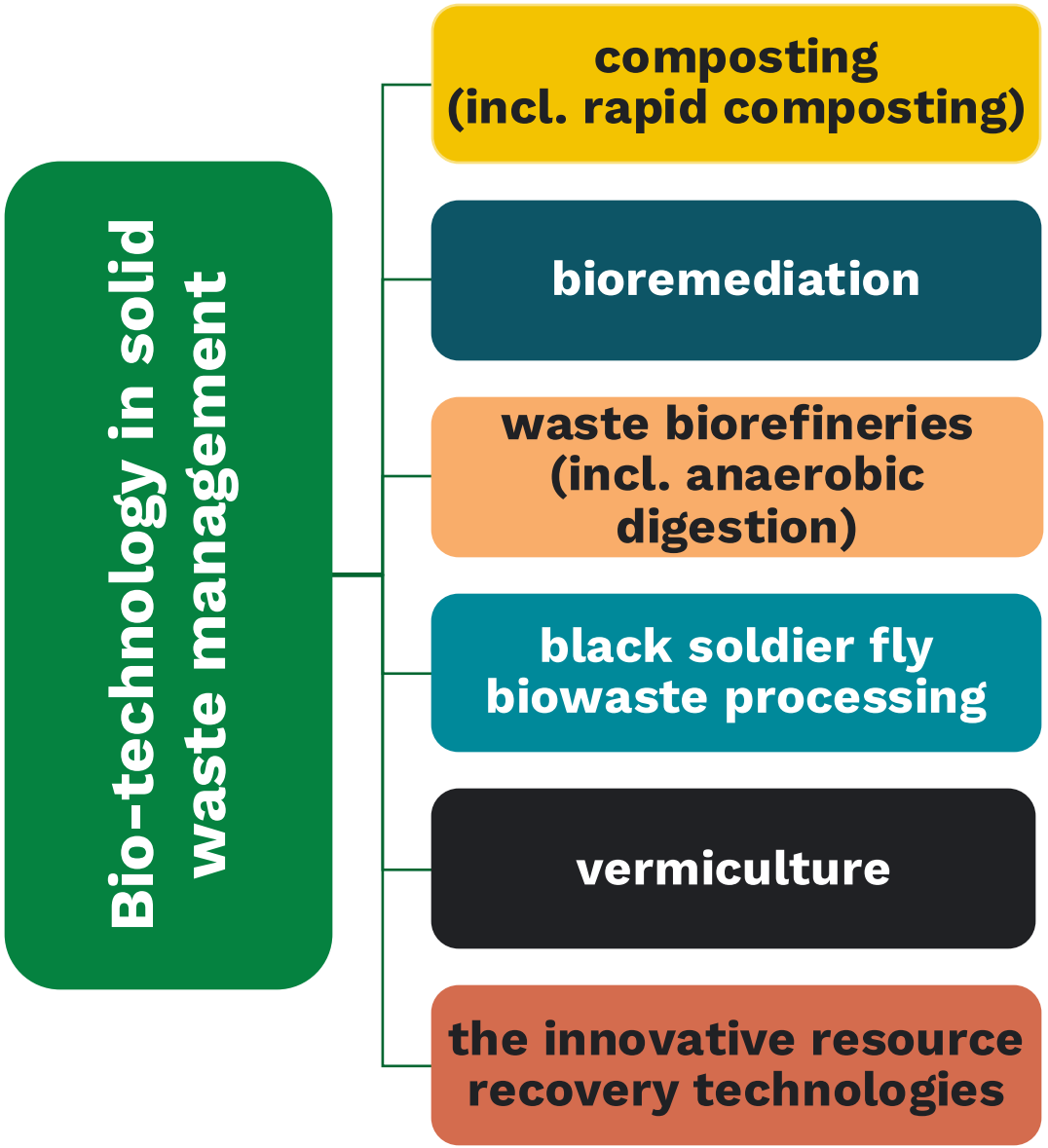
4. What are the potential bio-based technologies in solid waste management that Bio4HUMAN will be looking for?



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5. Practical examples of “bio-based innovative solutions” with potential relevance for Bio4HUMAN

BIO4HUMAN

Solutions for replacing non – renewable materials with concrete products conveying sustainability

Solutions for transforming the waste and utilizing it for innovative products with high energy efficiency and low impact on the natural environment

New and original applications of residues – as a standalone resources or after further processing and mixing

Ideas for recombining the biobased materials and further ingredients

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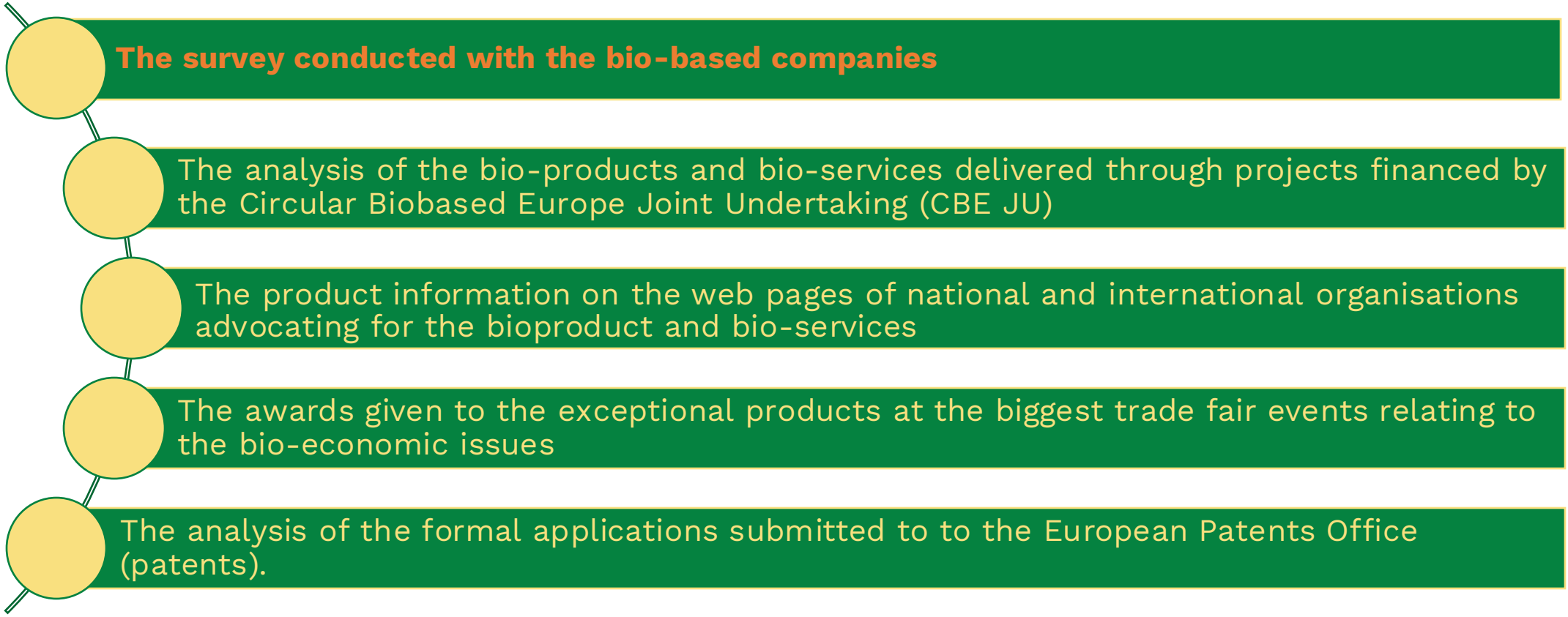
NEXT STEPS

BIO4HUMAN

- BIO4HUMAN is now collecting information of different bio-based solutions that could apply to humanitarian context. For this, different lines of investigation have been defined in order to arrive to 10 bio-based solutions for humanitarian sector. This solutions will undergo and LCA , LCC and social assesment.



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NEXT STEPS

- BIO4HUMAN is now collecting information of different bio-based solutions that could apply to humanitarian context. For this, the outputs of the lines of investigation should be 10 bio-based solutions for humanitarian sector. This solutions will undergo and LCA , LCC and social assesment.

- One of the lines of investigation is related to a **survey conducted with Biobased indutries. WE NEED YOUR INPUTS. Please answer the survey, it will not take longer than 5 minutes**.

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BIO4HUMAN

Connect with us: inquiry@bio4human.eu

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BIORADAR

MONITORING SYSTEM OF THE ENVIRONMENTAL AND SOCIAL SUSTAINABILITY AND CIRCULARITY OF INDUSTRIAL BIO-BASED SYSTEMS

BIORADAR Implementation Scorecard

Hamburg University of Applied Sciences
HAW

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Circular Bio-based Europe Joint Undertaking

Bio-based Industries Consortium

Co-funded by the European Union

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BIORADAR

Consortium of 7 partners from 4 European countries led by YAGHMA B.V. (Netherlands)

1 University

2 RTOs

3 SMEs

1 Standardizatio n body

BIORADAR

Monitoring system of the environmental and Social sustainability and circularity of industrial Bio-based systems

- BioRadar project aims to help organizations, policy-makers and investors have the necessary information to step towards a more sustainable bio-based economic model:
  - Developing a set of environmental, social and circularity indicators, methods, and business models;
  - Developing AI-driven digital tools to assess the sustainability and circularity of industrial bio-based systems;
  - Developing Self-assessment platform for bio-based industry;
  - Aiding Bio-based SMEs to strengthen their competitiveness in addressing environmental and Social sustainability and circularity
- Contributing to European Green Deal goals incl. addressing social impacts

ENVIRONMENTAL IMPACTS, RISKS, AND COSTS

BIO-BASED SYSTEMS MONITORING

BENCHMARKS INDICATORS

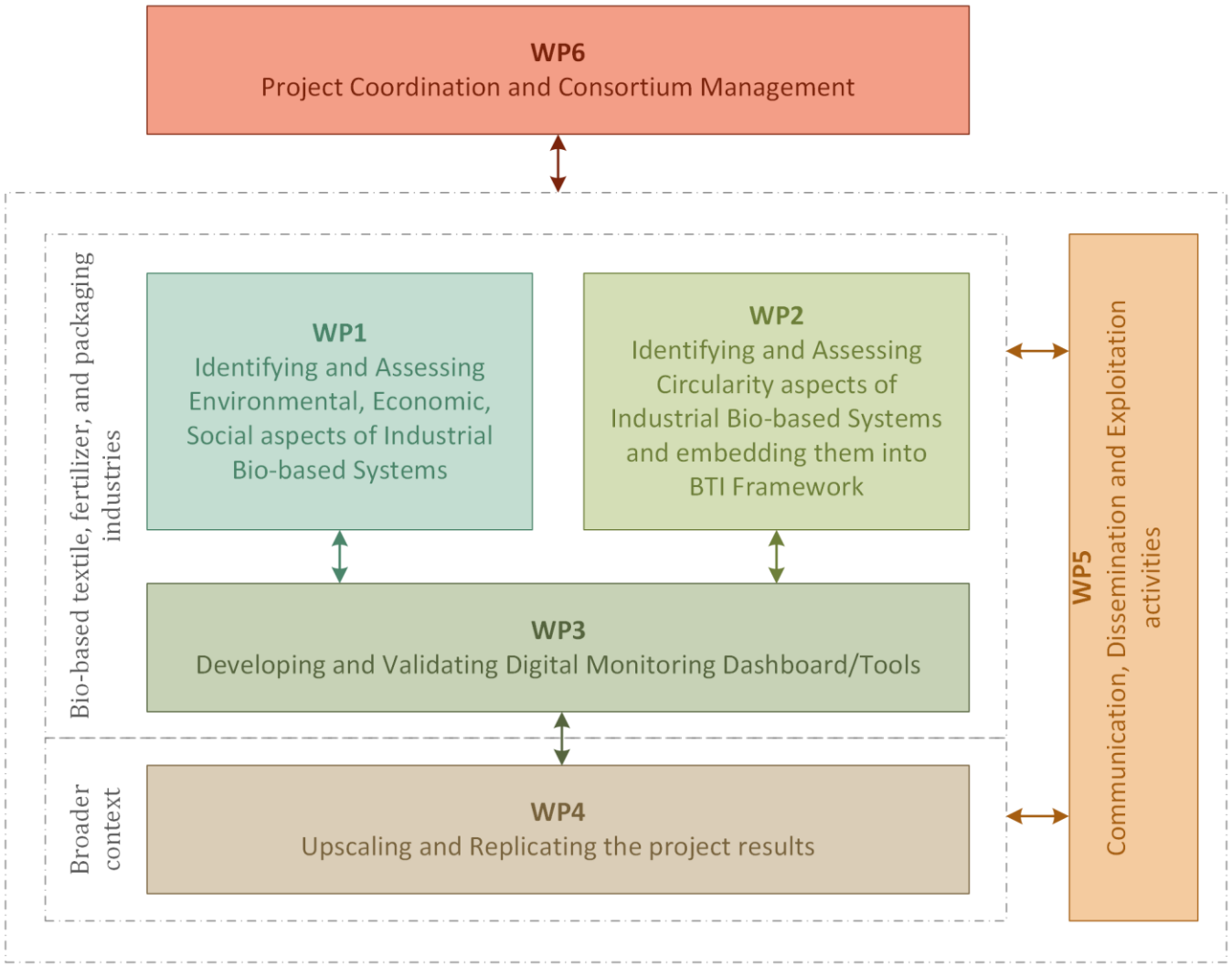
SOCIAL IMPLICATIONS

BEST PRACTICES

REGULATIONS MONITORING

INSTRUCTION AND SELF-ASSESSMENT

BIORADAR

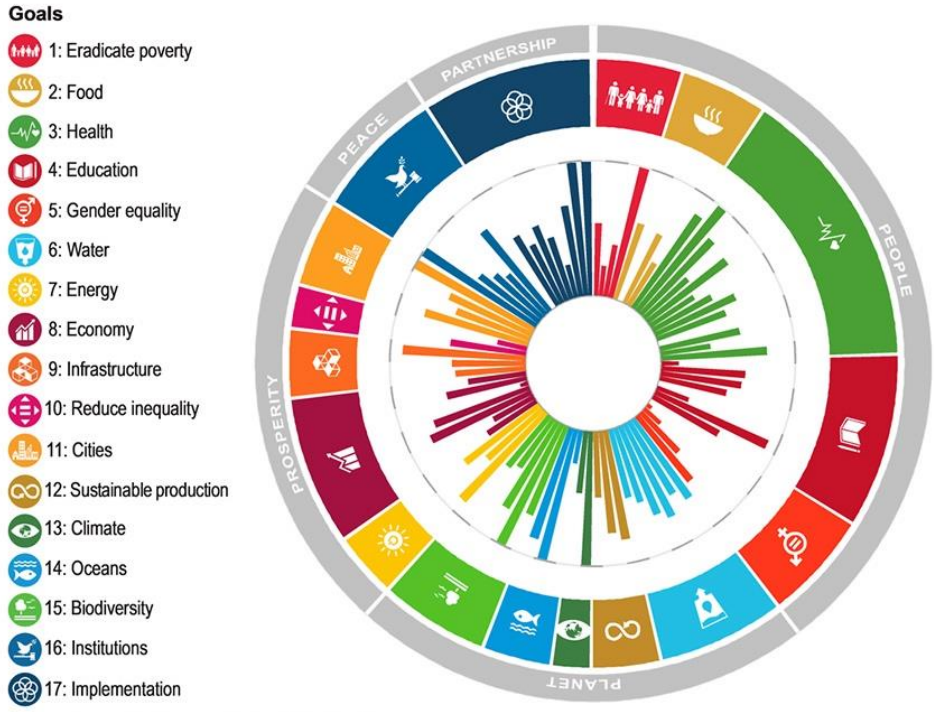

WP6
Project Coordination and Consortium Management
Bio-based textile, fertilizer, and packaging industries
WP1
Identifying and Assessing Environmental, Economic, Social aspects of Industrial Bio-based Systems
WP2
Identifying and Assessing Circularity aspects of Industrial Bio-based Systems and embedding them into BTI Framework
WP3
Developing and Validating Digital Monitoring Dashboard/Tools
Broader context
WP4
Upscaling and Replicating the project results
WP5
Communication, Dissemination and Exploitation activities

WP4 – Upscaling and Replicating the project results

WP leader: HAW

WP duration: M1 – M36

- **Set up of the "BIORADAR Replication Facility"**
- **Elaboration of the BIORADAR implementation scorecard**
- **Investigate novel Business Models eg. Servitisation-based Circularity-as-a-Service (CaaS)**
- **Exploitation and Business Plan (EBP) for replication and upscaling**
- **Improving professional skills and expertise**



“BioRADAR aims to provide organizations, decision-makers and investors [...] with information for the transition to a sustainable bio-based economic ”

Knowledge Platform

- Best Practices
- Knowledge Transfer

Standards search and standardization

Networking opportunities

BIORADAR Implementation Scorecard

- Estimate the contribution of the companies (SMEs) to 4 dimensions of sustainability (social, environmental, circular and economic) with special focus on the SDGs
- **Comparable** and **easily assessed**.
- **TARGET USERS:** Start-ups, SMEs, companies lacking sustainability plan
- Once scored, provide them with feedback for improvement into their path towards sustainability.

BIORADAR Implementation Scorecard

METHODOLOGY

1. **Identify and select relevant KPIs linked to SDG, corresponding to the 4 sustainbility dimensions: circular, environmental, economic, social. 4 KPI per SDG.**

2. **Develop a targeted questionnaire for each of the three use-cases**

3. **Relevant questions will be linked with the KPI and scoring system.**

Example: For each response, assign scores based on implementation levels (i.e., 1–5 scale).

BIORADAR Implementation Scorecard

METHODOLOGY

SCORING:

Score	Performance Level	Description
0	Not applicable	The KPI is not relevant or applicable to the company's operations or products.
1	Issue identified, but no plans for further actions	No improvement in sustainability practices. The company identifies the issue, and it is aware of it, but has no plans for further actions.
2	Issue identified, starts planning further actions	Small improvements in sustainability, with initial steps identified, but no clear plan established.
3	Action plan with clear targets and deadlines in place	Moderate improvement towards sustainability. The company is aware of the issue, with a detailed action plan and clearly identified targets in place.
4	Action plan operational – some progress in established targets	Significant improvement in sustainability practices. First progress in reaching the targets achieved.
5	Action plan operational – achieving the target set	Leading sustainability performance. Action plan is operational, and the targets set are met.

BIORADAR Implementation Scorecard

METHODOLOGY

4. **Aggregate and Visualize Results:**

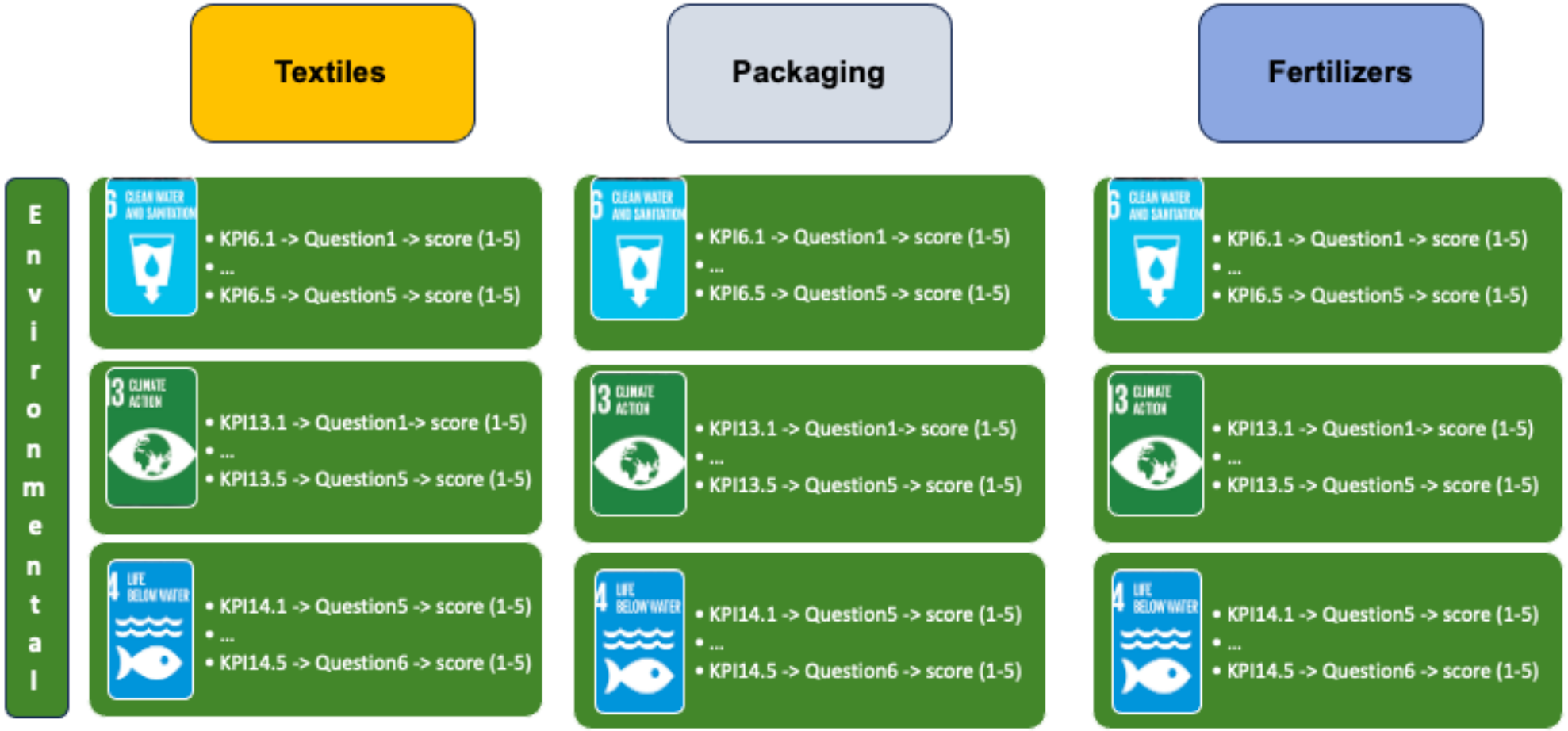
- Each sustainability dimension will have score from the individual KPIs, averaged per dimension to create an overall score.
- Visual scores. SME understand contributions to each SDG and identify areas for growth.
- Fully digitalized scorecard will be developed and launched for SMEs to self-assess sustainability.

5. **Feedback and Recommendations:**

- Provide actionable feedback based on results.
- Areas for improvement and highlight strengths, considering the specific use case and performance in each sustainability dimension.

Before the final implementation, the questionnaires will undergo pilot testing with a group of SMEs from each of the three bioeconomy sectors.

Structure



The approach will be used for all 4 sustainbility dimensions circular, environmental, economic, social

BIORADAR implementation scorecard

- Example - Use-case: Textiles

Use-case: TEXTILES					
SDG	**SDG Target**	**Sustainability dimension**	**KPI**	**Question**	**Source**
12	12.1. Implement a framework of programs on sustainable production and consumption	Circularity	Post-consumer recycled content	Has the company assessed the level of post-consumer recycled content of its products and developed a plan to increase it?	European Parliament - The impact of textile production and waste on the environment.
	12.2 Achieve the sustainable management and efficient use of natural resources	Environmental	Water footprint	Has the company identified its water withdrawal and implemented a plan to reduce water consumption in its operations?	UN Global Compact - 2022 Communication on Progress
	12.6 Encourage companies to adopt sustainable practices and to integrate sustainability information into their reporting cycle	Economic	Financial reporting	Has the organization assessed the impact of ESG factors on its financial performance, and developed a plan to report this impact in its financial statements?	SASB - Sustainability Accounting Standards Board Guide
	12.8 ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature	Social	Communication programs and actions promoting social corporate responsibility	Has the company identified the social impacts of its operations and products, and developed a plan to promote social corporate responsibility?	Quick guide to the Aichi Biodiversity Targets

BIORADAR

Thank you !