



LIFE-Repolyuse | REcovery of POLYurethane for reUSE in eco-efficient materials

## Recovery of industrial polyurethane waste for use in new construction materials

PLASTIC CIRCULARITY MULTIPLIER EVENT

October 16th, 2020



Plastics Circularity  
Multiplier

Project co-funded by the LIFE Programme  
of the European Union (LIFE16 ENV/ES/000254)





## SUMMARY

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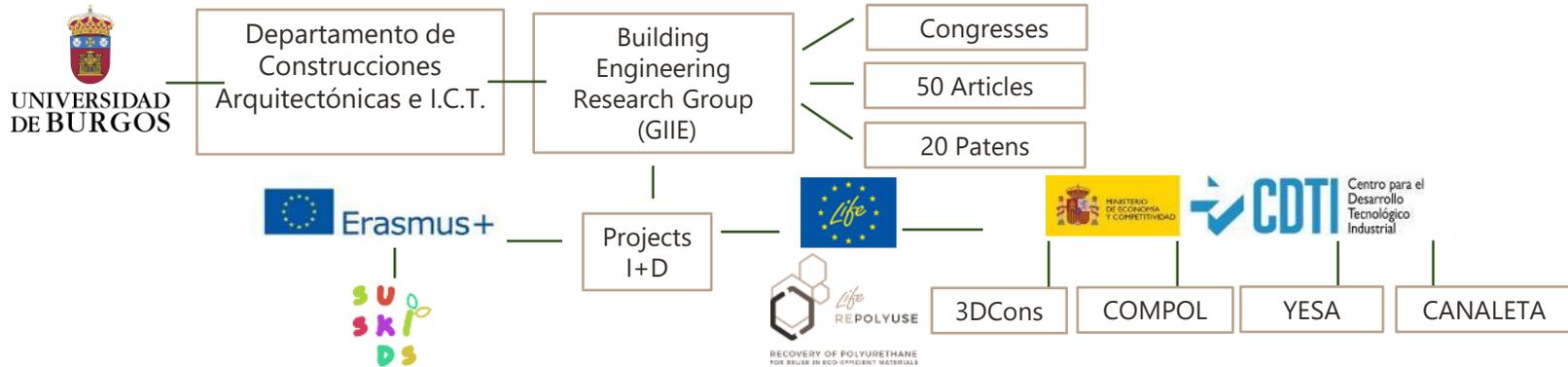
# 01

## About us

**University of Burgos (Spain)**

# UNIVERSITY OF BURGOS (SPAIN)

## Building Engineering Research Group (GIE)



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Consolidated Researcher

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Consolidated Researcher

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Scientific Project Manager

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Senior Researcher



# 02

## What is Life-Repolyuse?

**Project co-funded by the LIFE Programme  
of the European Union (LIFE16 ENV/ES/000254)**



# PROJECT LIFE-REPOLYUSE

REcovery of POLYurethane for reUSE in eco-efficient materials



## What is Life-Repolyuse?

LIFE-REPOLYUSE addresses the **problem of the management of plastic waste (polyurethane)**, through the use of innovative techniques of **reduction and reuse**, integrating them into **sustainable construction materials**, in order to prolong their useful life.

## Total Project duration

39 months

## Total budget / UE Contribution

1,289,434 € / 773,660 €

## Project Coordinator

University of Burgos

## Partners

TECSA (ACS group) (SSh Construction company)  
YESYFORMA (Manufacturer of gypsum ceiling tiles)  
UNIVERSITY OF COVENTRY, UK  
PANELES AISLANTES PENINSULARES (PAP), SPAIN



PROJECT  
LIFE16 ENV/ES/000254  
Co-funded by the  
LIFE Programme  
of the European Union





# PROJECT LIFE-REPOLYUSE

## Circular Economy



### PU Waste

Reuse in new gypsum-PUW tile



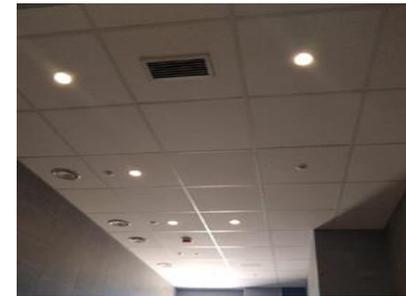
### Deconstruction

Waste from Gypsum-PU tiles



### Gypsum-PUW Product

Manufacturing



### Construction

Gypsum-PU ceiling tiles in real Demo-site's



# PROJECT LIFE-REPOLYUSE

The new material



The **main objective** of this project is to develop a **new building material**,  
a **prefabricated**, removable **ceiling tile with PU waste**.

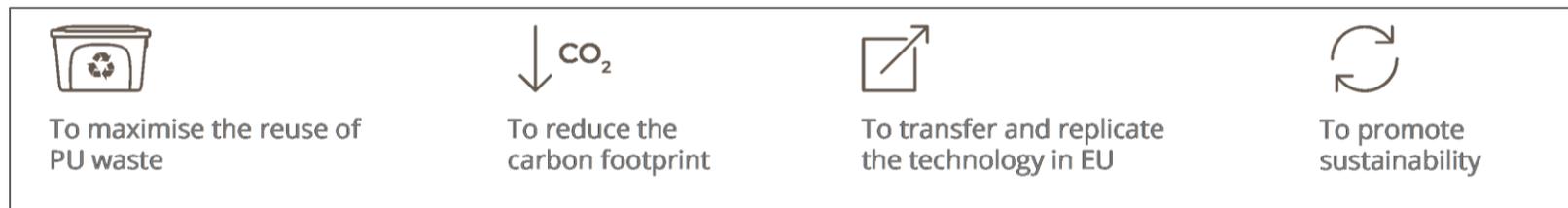


# PROJECT LIFE-REPOLYUSE

## Objectives



- **To maximise the reuse of PU Waste**
- **To reduce the carbon footprint:**
  - Reduce the environmental impact associated with incineration techniques
  - Reduce the extraction of natural resources as the implementation of the new technology can substitute gypsum by PUW.
  - Reduce the consumption of energy and water, compared to the current manufacturing processes
- **To transfer and replicate LIFE-REPOLYUSE technology to other EU countries**
- **To include civil society and local actors**





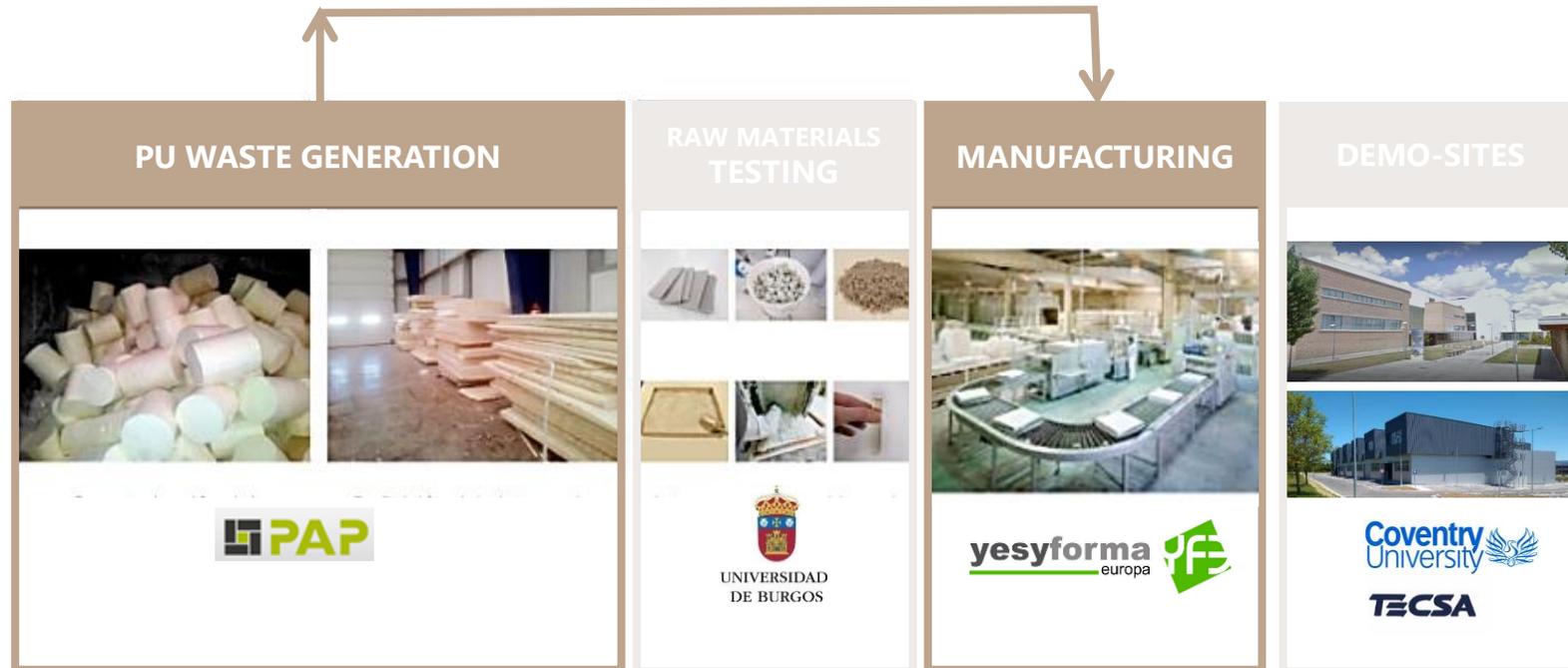
# 03

## Project development



# PROJECT LIFE-REPOLYUSE

## Work Plan





# PROJECT LIFE-REPOLYUSE

## The waste



### IMPURE PU WASTE



Rigid foam (P)  
Refrigeration sector



Semi-rigid foam (A) Automobile industry



Semi-rigid foam (AT)  
Automobile industry

### LEFT-OVER MATERIAL



Rigid foam (B)  
Refrigeration sector



Rigid foam (I)  
Refrigeration sector

### POST-CONSUMER WASTE



Flexible foam (SG)  
Treatment of end of life vehicles

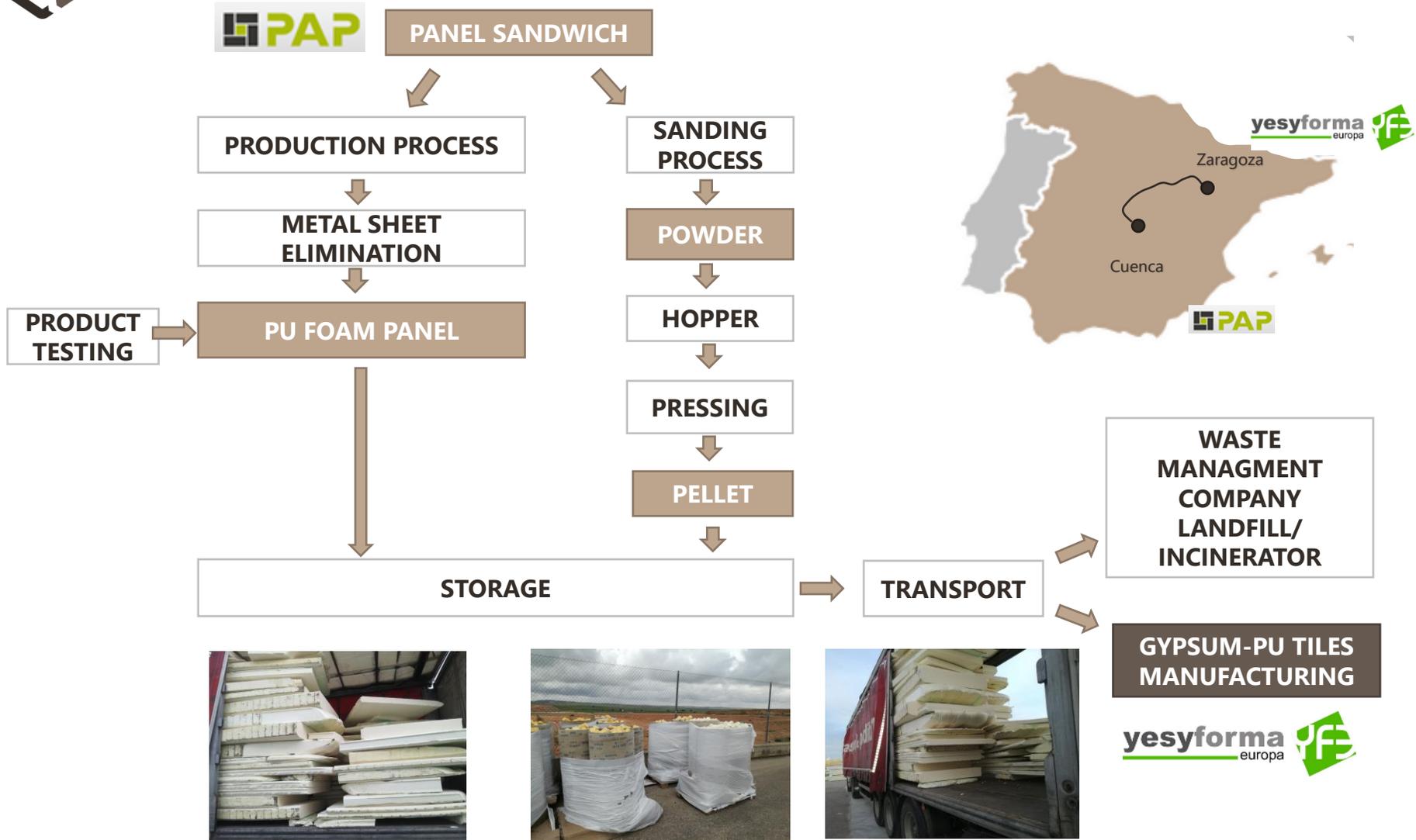


Rigid foam (EW)  
Refrigeration removal treatment



# PROJECT LIFE-REPOLYUSE

## Waste collection scheme





# PROJECT LIFE-REPOLYUSE

## Waste logistics



It is necessary to **ensure traceability** in all phases of the polyurethane waste management process. **Traceability is important to generate confidence** in products and processes, as well as to mitigate any possible negative environmental impact.

ORIGIN DATA	WASTE GENERATING COMPANY	NAME:		
		ADDRESS:		
	DATE OF MATERIAL MANUFACTURE			
			YES	NO
	TYPE OF WASTE	Polyurethane (PUR)		
		Polyisocyanurate (PIR)		
ORIGINAL WASTE FORMAT		BLOCK		
		POWDER		
WASTE TRANSFORMATION	TYPE OF TRANSFORMATION	CRUSHED		
		OTHER		
	WASTE FINAL FORMAT	BLOCK		
		PELLETS		
	TRANSPORT FORMAT	SACKS		
		PALLETS		
BOX				
DESTINATION COMPANY	TRANSPORT COMPANY	NAME:		
		ADDRESS:		
	TRANSPORTATION DATE			
WASTE DESTINATION COMPANY		NAME:		
		ADDRESS:		



# PROJECT LIFE-REPOLYUSE

The factory





# PROJECT LIFE-REPOLYUSE

The new product. Technical characteristics



Weight/m2: 32 %

Test	Result
 <b>Thermal conductivity</b>	Test based on the UNE-EN 12667 standard. The PU-gypsum ceiling tile improves the results of the standard gypsum tile by 26.7%
 <b>Reaction to fire and resistance to fire</b>	Result: A1. The classification of the PU-gypsum tile does not differ compared to the standard gypsum tile
 <b>Acoustic absorption coefficient</b>	Similar results for both tiles: <ul style="list-style-type: none"><li>• <math>\alpha_m</math> (average absorption coefficient) = 0.08</li><li>• NRC (noise reduction coefficient) = 0.12</li><li>• <math>\alpha_w</math> (weighted sound absorption coefficient) = 0.10</li></ul>



UTILITY MODEL

(PUBLICATION NUMBER: ES1241509)



# PROJECT LIFE-REPOLYUSE

The new product. Environmental characteristics



- The project could **recover** 75 tonnes of **PU foam waste** during the first year of its launch.
- This waste recovery means a **decrease in the use of raw materials**; (25.22%) saving of water and a (31.6%) reduction of gypsum.
- The new Life-Repolyuse tiles create an **improved temperature difference** between the outside and inside temperatures of the space in which they have been used (i.e. they have better thermal insulation qualities).
- The Life Cycle Analysis of the new product LIFE- REPOLYUSE has concluded that the new material, compared to a standard product, has significant improvements in **CO2 savings (14 %)** and **lower energy consumption** in its manufacturing processes (**16.6%**)



# PROJECT LIFE-REPOLYUSE

## EU Legislation on waste



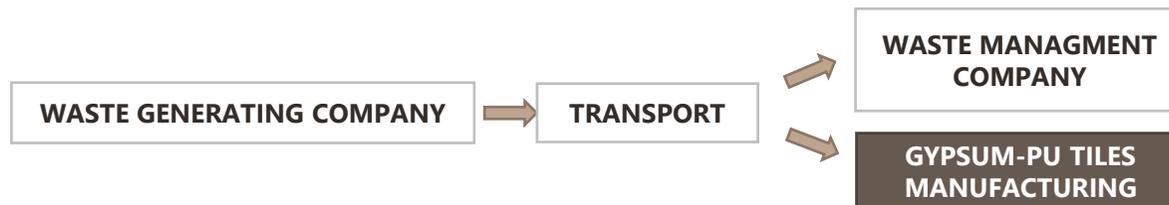


# PROJECT LIFE-REPOLYUSE

## Environmental Policies



- Several initiatives and **regulations** related to the **building and construction sectors** have been included in **public policies**, at national and regional levels (CDT, 2015; MINVU, 2013).
- Most of these **legal policies** are focussed on **reducing the environmental impact** during construction and operation phases, by efficiently using resources (energy and water) and including more sustainable materials for buildings.
- There are several EU initiatives in order to try to reduce the amount or plastic waste taken to landfill to "**Zero plastics to landfill**" and "**Plastics 2030**".



Waste recovery makes it possible for generating companies **to reduce waste management costs** as waste can be used as a raw material, and this also **solves an environmental problem**.



# 04

## Conclusions



# PROJECT LIFE-REPOLYUSE

## Conclusions



- LIFE-REPOLYUSE defines the **process of PU waste recovery from the generating industry to its use at the manufacturing plant.**
- The beneficial properties of the new construction material have been outlined such its **lightness**, its **low thermal conductivity and its fire reaction classification**, as well as the **beneficial environmental impact.**
- A new storage and shipment protocol has been developed to guarantee the **traceability** of the PU waste from its origin to its destination.
- Spain, Italy or Portugal, have a specific laws which permits **left-over** to be freely used as raw materials. , there still are currently some prohibitions.
- In the case of **PU waste**, the regulation that must be followed is the EU Directive on waste which makes it compulsory for the manufacturer to be registered as a waste manager.



Life  
REPOLYUSE

THANK YOU VERY MUCH  
FOR YOUR ATTENTION



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