

CIRC-PACK PROJECT

Open session  
25st June 2020

Aitana Sáez de Guinoa



**Plastics Circularity**  
Multiplier

“CIRC-PACK project results.  
Solutions to boost recycling”



This project has received funding from the European  
Union's Horizon 2020 research and innovation  
programme under grant agreement No 730423



# General objectives of the project



## Demo Case-A and B

.... Through increased recyclability and controlled biodegradation for targeted applications...

## Demo Case-A

... by exploring and adopting renewable feedstocks

Decoupling the value chain from fossil feedstocks



OIL



NATURAL GAS

Reduce the negative environmental impact of plastic packaging



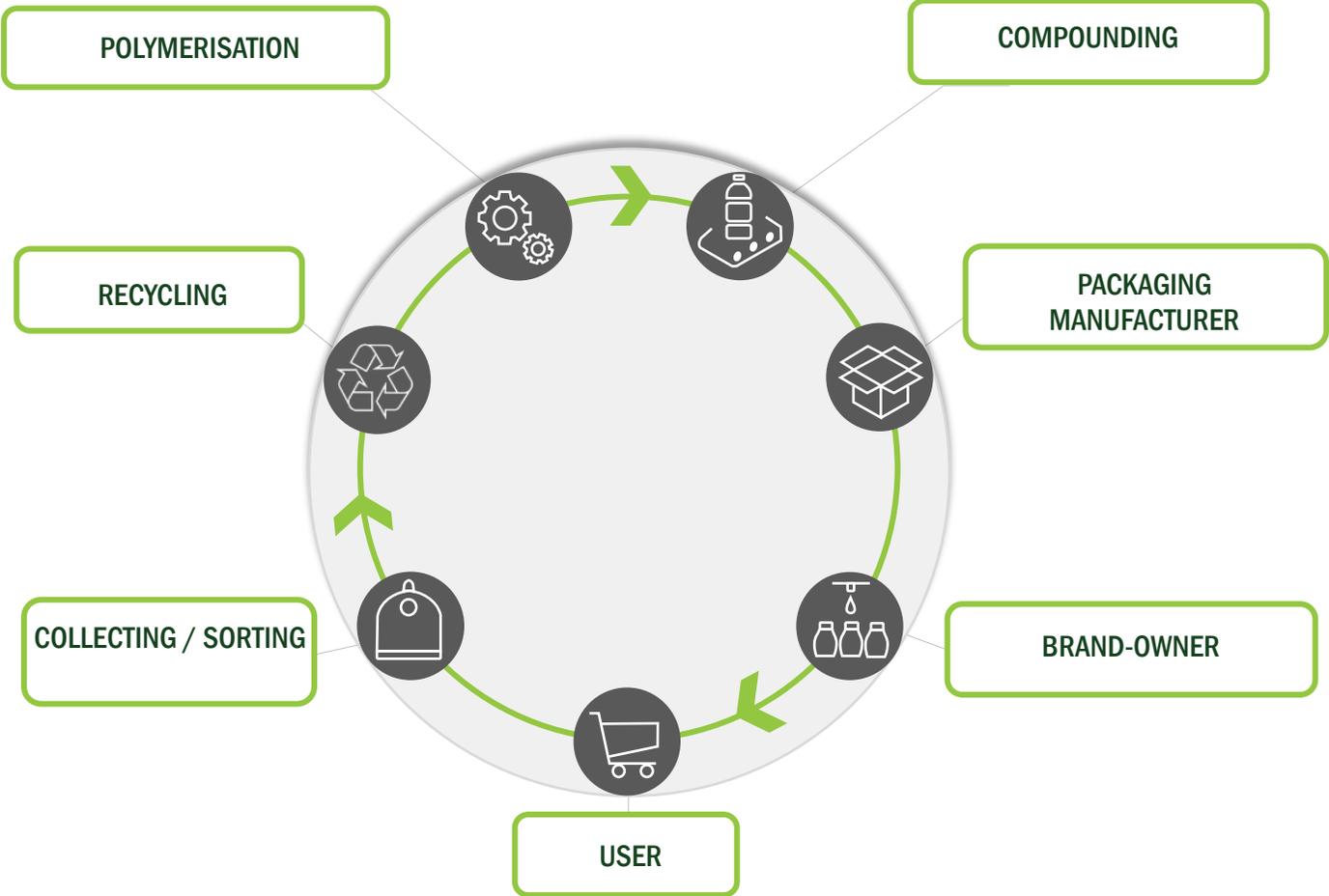
## Demo Case-C

... by improving the economics and reliability of recycling

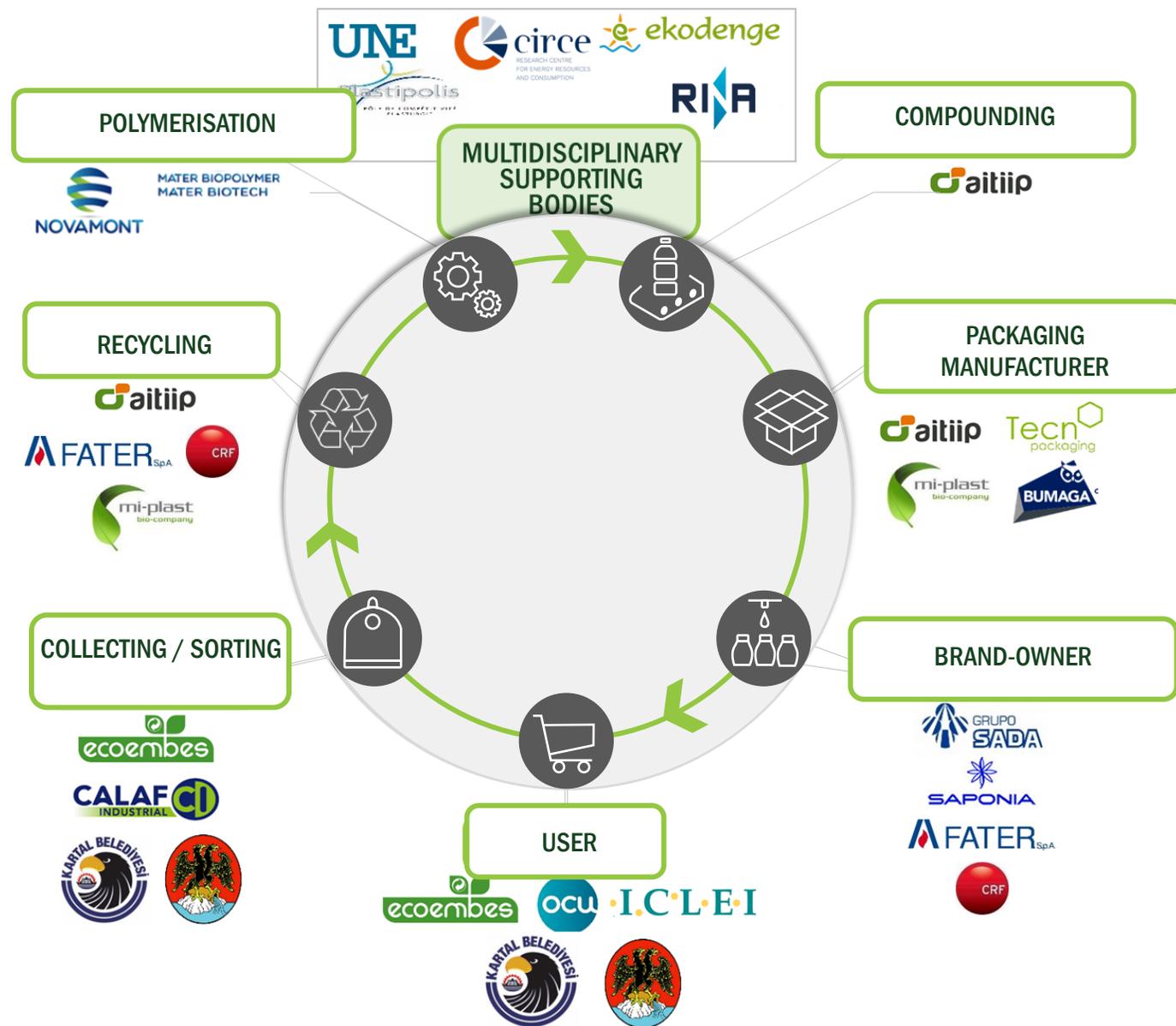
Create an effective after-use plastics economy



# All the value chain involved



# All the value chain involved



# PROJECT'S RESULTS

Uptake of recycling

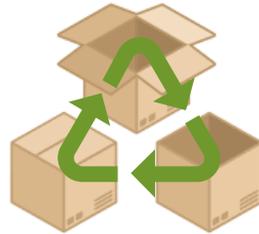


# CIRC-PACK Results and Recycling



▶ Only **12%** of the materials used by EU industry come from recycling.

Source: Eurostat, 2016 figures

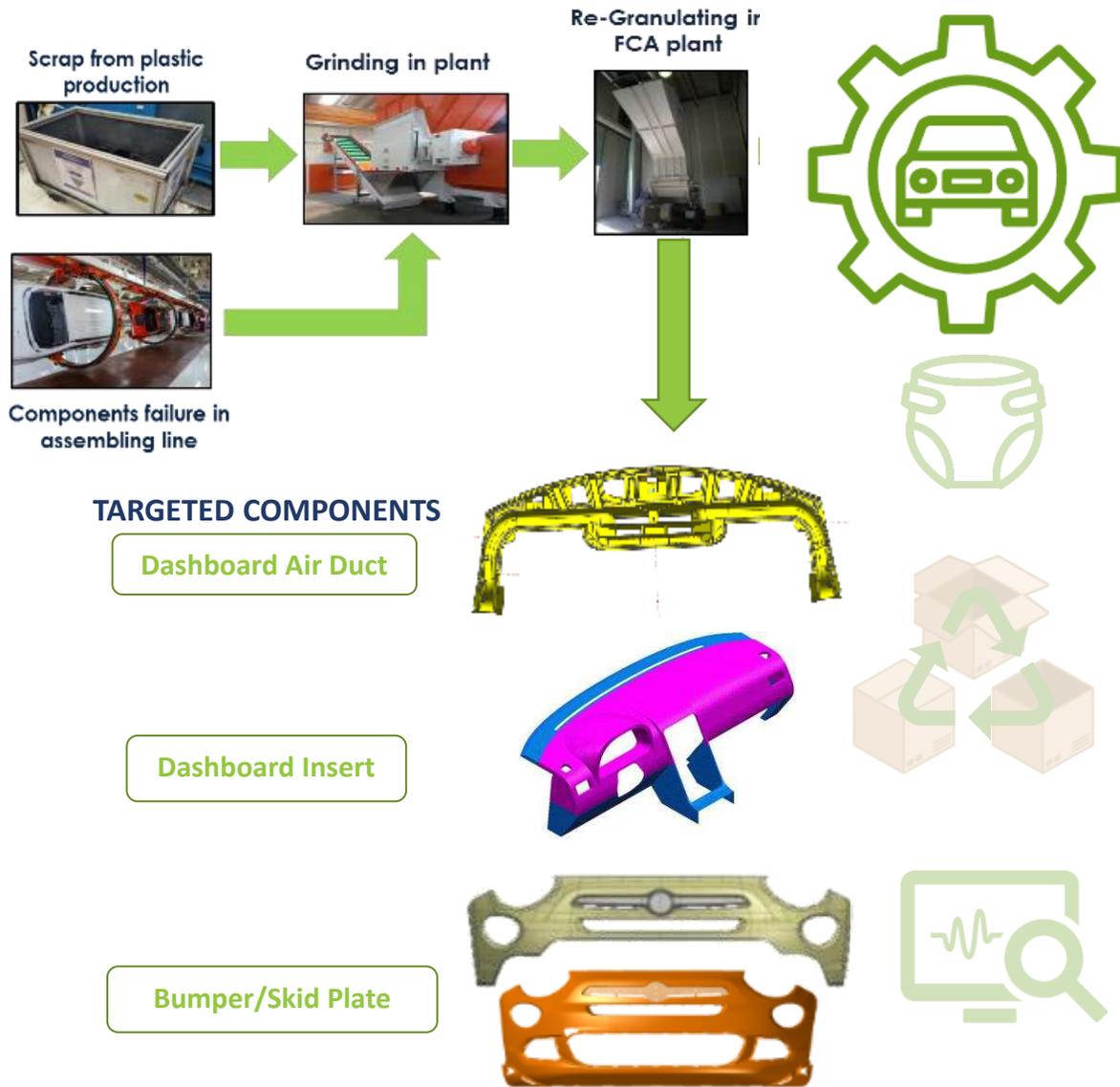


The Commission will propose measures to ensure that **all packaging in the EU is reusable or recyclable** by 2030.

# CIRC-PACK Results and Recycling



AUTOMOTIVE SECTOR



Scraps recovered can be closed-loop recycled for several components → 20% to 100% recycled content.

+

Validation of other sources of recycled PP



Reduction in the virgin PP consumption of **21-39%** (closed-loop + post-consumer PP)

**500 T** of scraps are recovered and introduced in new car components, just in one plant

**Economic savings from 9% to 14%**

# CIRC-PACK Results and Recycling



AHP RECYCLING



Plant upgraded. Fractions successfully separated and improved quality (plastic, cellulose, SAP)

**Plastic fraction** converted into products by injection moulding with a 60% content (boxes) and 100% (mini pallets).

**Cellulose** can be used as 2G source of fermentable sugars for biopolymer-building blocks production (bio-BDO)

High Extrapolation potential: 30 Mt are dumped globally

**Economic savings of 20% (minipallet), increased in box**



# CIRC-PACK Results and Recycling



**MULTIMATERIAL ECODSIGN**

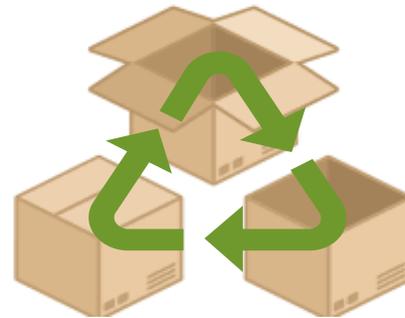
PE-laminated Cardboard (non-recyclable) box replaced by biopolymer dispersion coating (vapour barrier) → fully recyclable

High replicability potential: > 70.000 T (EU)

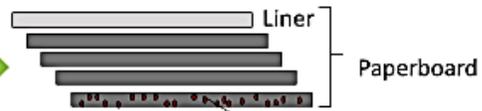
**SAPONIA** about to introduce the development

**SAPPI** now exploring similar solutions for other sectors/users → larger market potential

**Validated by consumers**



 **Bio-based recyclable materials**



Dispersion coating to add barrier properties





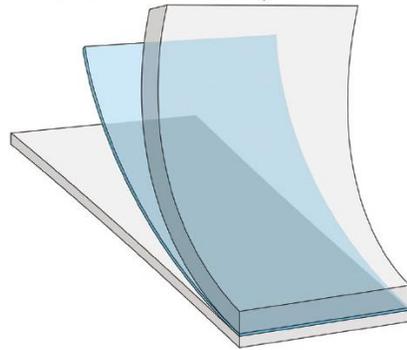
# CIRC-PACK Results and Recycling



Sealing machine



CIRCPACK tray sealed for barrier test



MULTILAYER FILMS ECODESIGN

Substitution of non-recyclable multilayer films in food packaging (sealing trays) by a:

- + monomaterial
- + barrier properties
- + Biobased
- + compostable (biologically recyclable).

**Sada is in the final refinements to introduce the innovations (film + trays) for their products**

# CIRC-PACK Results and Recycling



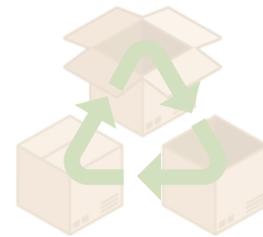
Extrusion of PE



Extrusion of PP



Extruder monitored



**Heterogeneity of post-consumer plastic wastes hampers reliable flows of recycled materials**

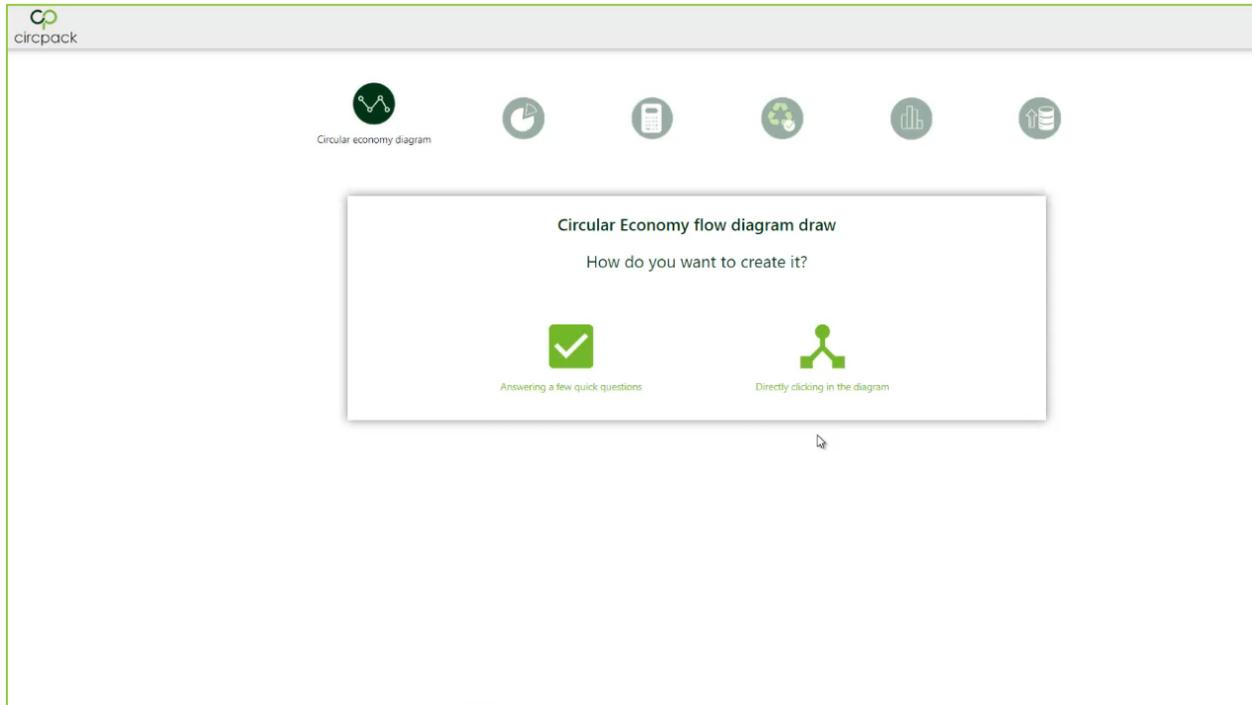


Real-time **monitoring** of the quality of the recycled material during extrusion → allows the adaptation of operational parameters → modify final properties → **ensure the quality** (according to the final application requirements)

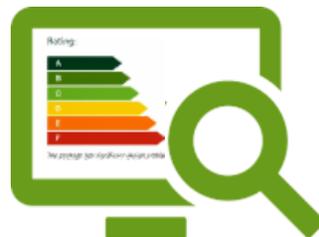
**PP and PE have been studied so far. Before going to the market, more properties will be studied.**



# CIRC-PACK Results and Recycling



<https://circpack.fcirce.es>



## ECODESIGN TOOL

The objective of the tool is to help packaging manufacturers and designers in:

- Transition to more sustainable packagings,
- and rise awareness/disseminate on how to improve the circularity and recyclability of packaging

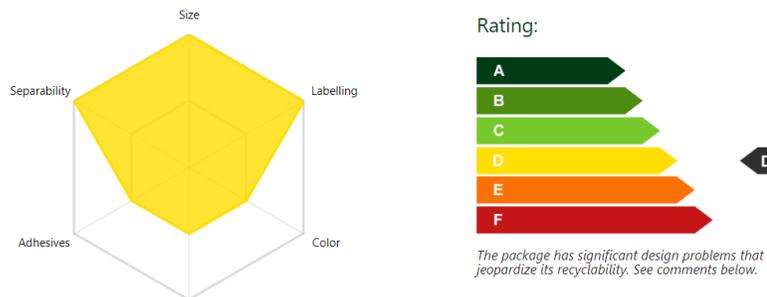
In line with the objective of the EC of all packaging in the EU to be reusable or recyclable by 2030



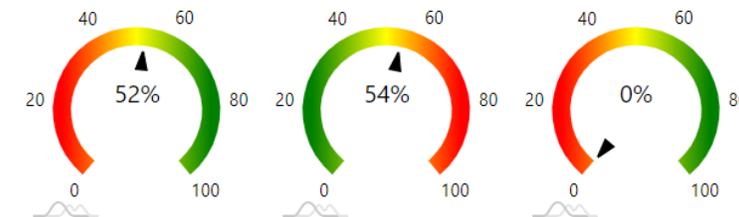
# CIRC-PAK Results and Recycling

## RESULTS:

### Recyclability check



### Circularity indicators



MCI: Material Circularity Index

Linear flow index

Recycling Input Rate

### Circular Diagram



#### Color

Strongly-coloured plastic materials have a much lower economic value than non-pigmented plastics. This is mainly due to the lower number of final applications as compared to non-pigmented materials. Additionally, they can interfere with the common optical sorting systems (NIR) used to identify the type of plastic.

#### Ink/Dyes

Hazardous substances should be avoided and inks containing heavy metals, since they can contaminate the recycled plastic. Thus, it is recommended to comply with the Exclusion List for Printing Inks and Related Products, prepared by the European Technical Committee for Printing Inks (EuPIA).

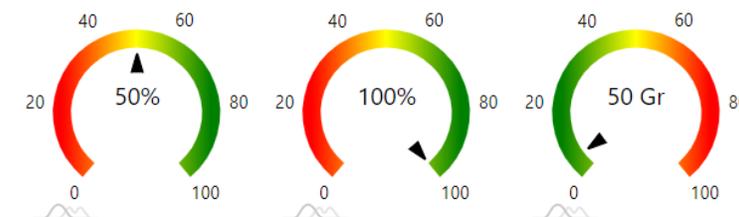
#### Adhesives

Water-soluble (or dispersible) adhesives at temperatures between 60 and 80°C and hot melt-soluble adhesives are the best option, since they are the ones that are most easily removed in the recycling process. In any case, the amount of adhesive used and its area of application should be minimized, in order to maximize performance and facilitate the recycling process.

### Compatibility Matrix

	PE	PP/OPP
PS		

- Generally, the secondary material is compatible with the main body's material (PS), or can be separated, and is accepted in the main recycling processes in large quantities.
- The use of the secondary material might cause serious recycling problems if used in large quantities. Under certain specific conditions, the material could be recyclable, but this would need to be confirmed with the corresponding recycling organizations and / or local recyclers



Compostability rate

Biobased input rate

Unrecovered waste related to the product



# CIRC-PACK Results and Recycling

## ECO-DESIGN MEASURES MODULE



### Design and manufacturing

Optimization of materials used

- Change of materials type
- Reduction of weight
- Reformatted Dematerialisation

Material Used

- Compostable
- Biobased
- Reused components/ feedstock
- Use recycled materials
- Biodegradable

< 1 2 3 >

### Commercialisation and use

Life/use extension

- Reuse / refill
- Repair and maintenance
- Shared use, new functionalities
- Other life extension

< 1 2 3 >

### End of life

Design for recycling

- Recyclable packaging
- Improve Recyclability

< 1 2 3 >

Continue



**THANK YOU VERY MUCH  
FOR YOUR ATTENTION!**

[asaez@fcirce.es](mailto:asaez@fcirce.es)  
[info@circpack.eu](mailto:info@circpack.eu)





[www.circpack.eu](http://www.circpack.eu)



[https://twitter.com/circ\\_economy](https://twitter.com/circ_economy)



<https://www.linkedin.com/groups/12055948/>



**Disclaimer:** The sole responsibility for any error or omissions lies with the editor. The content does not necessarily reflect the opinion of the European Commission. The European Commission is also not responsible for any use that may be made of the information contained herein.

