

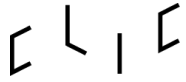


# 4R recycling ecosystem RDI roadmap

**Functional bio-based and circular solutions for retail packaging**

24.8.2022 v1.1





**SYSTEMIC  
CHALLENGE**

that stems from  
diversified waste  
material streams

**FUNCTIONAL  
BIO-BASED AND  
CIRCULAR  
SOLUTIONS FOR  
RETAIL PACKAGING**



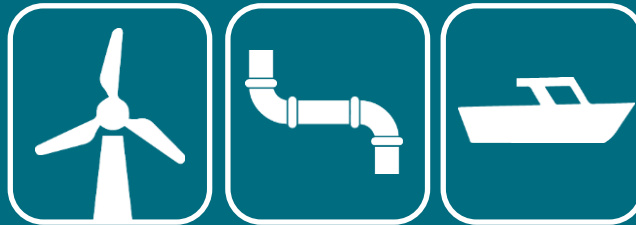
**RECYCLING  
TECHNOLOGIES FOR  
RETAIL PACKAGING**



**PLASTICS AND  
COMPOSITES IN  
CONSTRUCTION  
INDUSTRY**



**RECYCLING OF  
BULKY FIBRE-  
REINFORCED  
PLASTIC PRODUCTS  
AND INDUSTRIAL  
SIDE-STREAMS**





## FUNCTIONAL BIO-BASED AND CIRCULAR SOLUTIONS FOR RETAIL PACKAGING

### GOALS

85 % of biomaterials  
Processing methods  
Desired properties, barrier properties and recyclability  
Recycling options for demanding packaging

2024

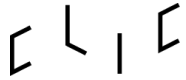
90 % of biomaterials  
Variety of bio-based plastic packaging available  
Bio-based packaging and recycled biomaterials in demanding food packaging demonstrated

2027

Several 100 % bio-based packaging available  
Increased share of bio-based materials achieved  
Future requirements tackled  
Increase in recycling rate enabled

2030





# GOALS Now

State-of-the-Art review to the types of packaging used in grocery trade at the moment, volumes of different types, and amount of bio-content per packaging type.

After the review, development roadmaps for each type.





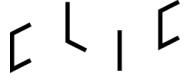
# GOALS Milestone 2024

- ✓ Target level of around 85 % for biomaterials in grocery trade packaging is achieved
- ✓ Needs of brand owners for grocery trade packaging are mapped
- ✓ Processing methods are developed for a range of potential bio-based raw materials for grocery trade packaging
- ✓ New concepts are developed for grocery trade packaging with desired properties without fossil-based plastics
- ✓ Good barrier properties and recyclability are achieved for fibre-based packaging including food contact materials
- ✓ Understanding on the holistic sustainability of the bio-based packaging is achieved
- ✓ Recycling options are available for demanding bioplastic and multimaterial packaging



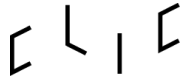
# GOALS Milestone 2027

- ✓ Target level of over 90 % for biomaterials in grocery trade packaging is achieved
- ✓ Variety of bio-based plastic packaging materials with good recyclability are available with a target to achieving 95 % recyclability
- ✓ Industrial-scale demonstrations of bio-based packaging in demanding food packaging are performed
- ✓ Life cycle assessment of bio-based packaging is done with product environmental footprint (PEF)
- ✓ Use of recycled biomaterials in demanding food packaging is demonstrated



# GOALS Milestone 2030

- ✓ Several 100 % bio-based packaging solutions are available with good recyclability options
- ✓ Increased share of bio-based materials achieved in all grocery trade packaging
- ✓ Bio-based packaging fulfills requirements of also the future sustainable packaging
- ✓ Increase in recycling rate of bio-based plastic and fibre-based packaging in grocery trade is enabled

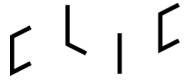


# Widening of biomaterial sources for the bio-based packaging

## 2024

- ✓ Ensuring **availability of new biomaterials** sources
- ✓ Development of **safe and efficient use of side streams** in production of bio-based packaging
- ✓ Increasing **sustainability of the processing** of new biomaterial sources
- ✓ Understanding how to use **recycled biomaterials in food packaging**
- ✓ Improving **safety of recycled materials** in food packaging





# Widening of biomaterial sources for the bio-based packaging

## 2027

- ✓ Development of **safe and efficient use of waste streams** in production of packaging for grocery trade
- ✓ Demonstration of the use of **recycled materials in demanding food packaging**

## 2030

- ✓ Development of **new raw material alternatives** e.g. through carbon capture and utilization, Power-to -X technologies and biotechnology approaches
- ✓ Piloting of **new end-uses** (beyond the food contact applications) **for recycled materials** in grocery trade products



# Development of production processes for bio-based packaging

## 2024

- ✓ Identification and development of the **interoperability of biomaterials with the existing value chains** and manufacturing systems for packaging
- ✓ Development of **more viable and cost-efficient production methods for bioplastics**
- ✓ Increase in resource efficiency through **sustainable chemistry** and circularity approaches

## 2027

- ✓ Development and **ramp-up of new** business and process **concepts**

## 2030

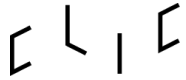
- ✓ Development of the bio-based packaging to meet the **future product requirements**



# Development of bio-based plastics packaging in grocery trade

## 2024

- ✓ Development of the **material properties** (especially O<sub>2</sub> and moisture barrier properties) of bio-based plastics
- ✓ Development of **new bio-based plastic** materials fulfilling the food safety requirements
- ✓ Understanding of the optimal **end-uses for biodegradable plastic** packaging



# Development of fibre-based packaging in grocery trade

## 2024

- ✓ Development of **improved characteristics** of fibre-based packaging including moisture tolerance, grease barrier properties, elongation, formability and shrinkage
- ✓ Development of **flexible films and coatings** for grocery trade packaging that are bio-based, recyclable and preferably biodegradable

## 2027

- ✓ Development of **novel hybrid materials** with complex structures and clarified end-of-life options for packaging enabling new functionalities
- ✓ **Demonstrations of new advanced functional properties** and performances in fibre-based packaging

## 2030

- ✓ Demonstration of **novel end use applications** for fibre-based packaging



# Sustainability and safety of bio-based packaging in grocery trade

## 2024

- ✓ Development of methods to **assess the holistic sustainability** of the bio-based packaging
- ✓ Development of **measuring the bio-based content** in products
- ✓ Development of **food safety** and understanding comprehensively the sustainability of prolonging food “life”

## 2027

- ✓ **Demonstrations of biomaterials performance** and sustainability to achieve the level set by legislation

## 2030

- ✓ **Scale-up**, broader adoption of the use of materials



# Recycling of bio-based packaging

## Now

- ✓ Mapping of collection and sorting of bio-based packaging

## 2024

- ✓ Development of **recyclability of fibre-based packaging** including food contact materials
- ✓ Development of **recycling options for demanding bioplastic and multimaterial packaging**
- ✓ Formulation of **design-for-recycling approaches** for bio-based packaging

## 2027

- ✓ Demonstration of **recycling of bio-based and biodegradable plastics**
- ✓ Development of the needed **collection and sorting methods** and other infrastructure for the recycling of bio-based packaging
- ✓ Formulation of the improved **design-for-recycling principles for hybrid and layered materials**