Generalitat de Catalunya
Departament de Territori i Sostenibilitat
Secretaria de Medi Ambient i Sostenibilitat

CircE
Interreg Europe

"CircE - European regions toward Circular Economy"

INTERREG Europe Project

Priority Opportunities

Project Partner 2

Catalonia

European Union
European Regional Development Fund

1. Executive summary

The final priority opportunities were defined by applying the CircE Analytic Hierarchy Process (AHP) for prioritizing opportunities, proposed by ITIA-CNR from PP01 team. Once the perspective from which the prioritization was going to be undertaken was clarified (the regional government's perspective), the development of a Criteria Tree that suited our context and SHs started, departing from the Criteria Tree presented by the LP on the 15th of June in Gelderland.

So as to test and adapt this Criteria Tree to Catalonia, two SH meetings were held on the 21st of June: one gathering SHs from the Beverage sector and another one for the Textile sector. As a result of the meetings, two new sub-criteria were included within the building block regarding Strategic Impact of the Criteria Tree: a) the need for governmental support to develop the opportunity; and b) CE transformation potential of the opportunity.

Having a Criteria Tree that suited our context, our CE consultants made a proposal of pairwise comparison, which was validated by the Government of Catalonia, and the overall weights were calculated. In order to obtain the final priority ranking, first of all, scores were given to each opportunity and then the different weights obtained were applied. Finally, taking into consideration the prioritization ranking, opportunities were grouped according to three typologies:

- Opportunities set as top priorities in the agenda: Those with scores above 7 (in green).
- Opportunities to be prioritized when possible: Those with scores between 7-5 (in blue).
- Opportunities that need further assessment: Those with scores below 5 (in yellow).

Table 1: Opportunities prioritized for the textile sector (left) and beverage sector (right).

Increase the capacity of post-consumer textile collection	Preventing foodwaste along the value chain
Increase the reciclability, recycling & the use of recycled fibres, threads and fabrics	Increase the reuse of glass packaging
Explore new ways of upcycling pre-consumer textile waste for industrial uses	Use of recycled packaging materials
Scale up the creation of new business models	Increase the implementation of smart packaging solutions
Ecodesign for durability	Minimising material use for beverage distirbution
Intensify search of alternatives to prevent effects of microfibre release & other substances of concern during the product lifecycle	Increase water savings and water efficiency during production
Increase savings and water and energy efficiency used during the production process	Scaling the creation of new valuable industry products from by-products
	Use of biobased and/or compostable materials for plastic packaging where beneficial

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2. Prioritization

How we used the Criteria tree

The final priority opportunities were defined by applying the CircE Analytic Hierarchy Process (AHP) for prioritizing opportunities, proposed by ITIA-CNR from PP01 team. The AHP was thus the main *tool* used to prioritize, however, prioritization was a *process* that started by clarifying the perspective from which the prioritization was undertaken, this is to say, the regional government's perspective.

Then, the cornerstone of the AHP adaptation began: the development of a Criteria Tree that suited our context and SHs. For that, we departed from the Criteria Tree presented by the LP on the 15th of June in Gelderland, which consisted on the following criteria and sub-criteria:

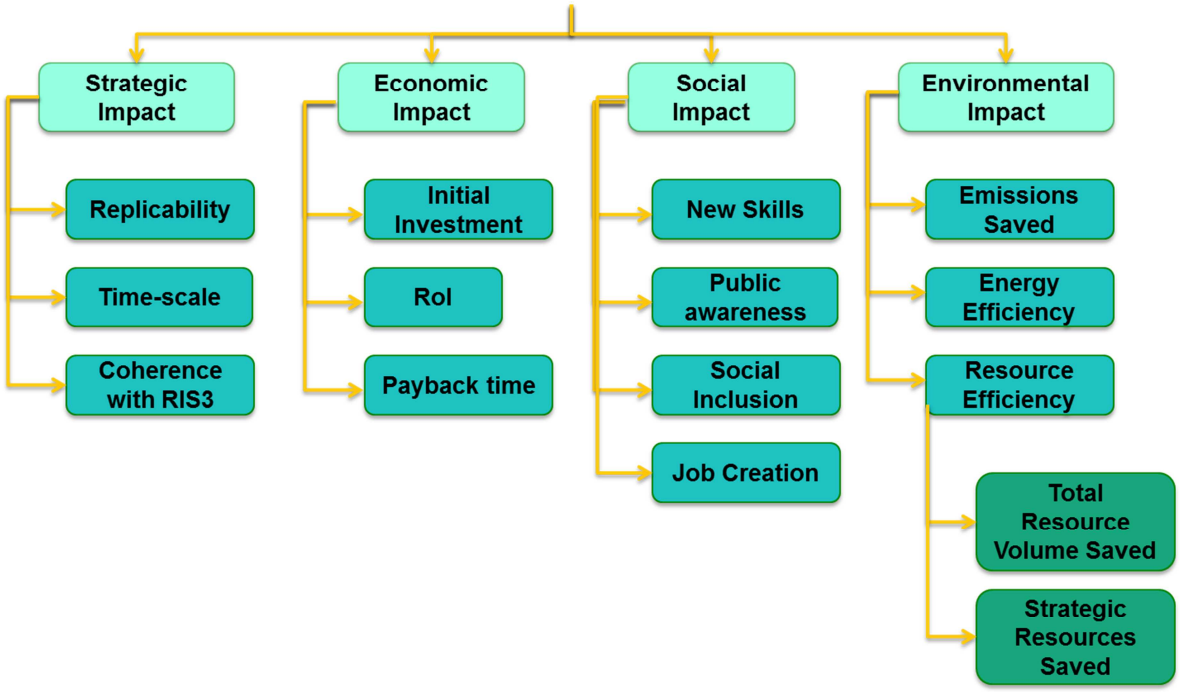

Table 2: CircE Criteria Tree (Gelderland, June 2018).

So as to test this Criteria tree and adapt it to Catalonia, two SH meetings were held on the 21st of June: one gathering SHs from the Beverage sector and another one for the Textile sector. The meetings started with a presentation of the opportunities identified for both sectors[1]. Next, the four building blocks of the prioritization model (strategic impact, economic impact, social impact and environmental impact) were explained. Then a dynamic discussion started that aimed at reaching a consensus position on "high and low importance" opportunities in terms of sector interest, need for governmental support, time-scale, CE transformation potential, replicability, social impact and need for new skills.

[1] All participants had previously received fact sheets on the main CE opportunities detected.

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Since aspects like amount of investment, payback time, emissions saved, energy efficiency, resource volume saved and strategic resources saved are quantitative, estimated values provided by our CE consultants were used to compare opportunities.

As a result of the discussion, two new sub-criteria were included within the building block regarding Strategic Impact of the Criteria Tree:

- The need for governmental support to develop the opportunity: It was considered that a low level of sectorial autonomy to develop a CE opportunity requires a high need for governmental support if an opportunity is to be implemented and, thus, a high need for the development of policy tools to boost the opportunity. It was considered as a very important sub-criterion since it will be crucial to elaborate the Plan.
- CE transformation potential of the opportunity: It was suggested that CE opportunities have different levels of CE transformation potential and, thus, those with the highest level of transformation potential should be prioritized.

How we defined the weights

Having a Criteria Tree that suited our context, our CE consultants made a proposal of pairwise comparison, which was validated by the Government of Catalonia. The results of the pairwise comparison are presented in Annex 1.

The final weights obtained for the different criteria and subcriteria are the following:

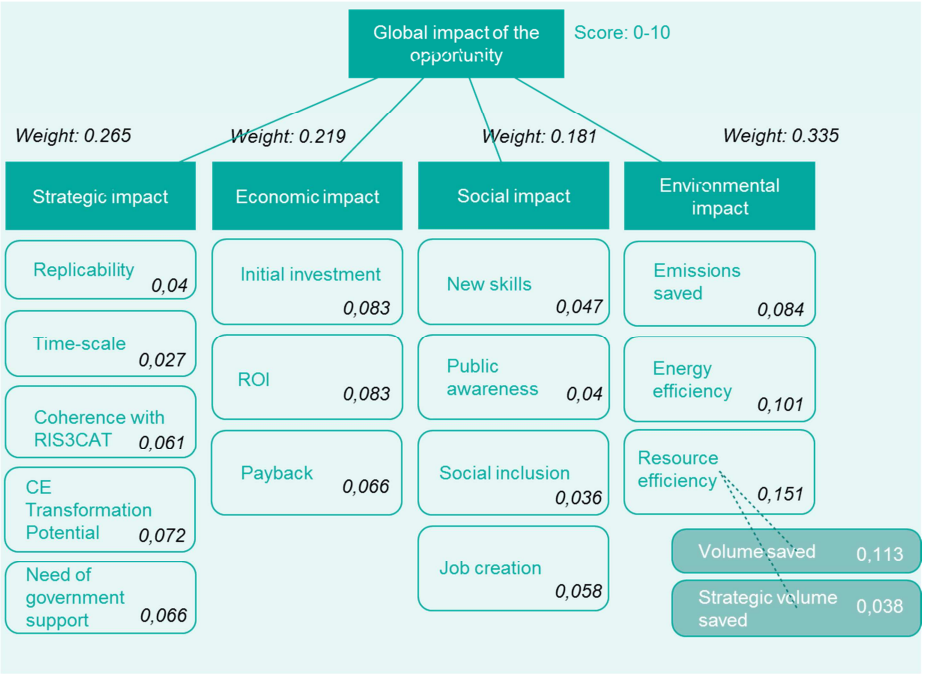

Table 3: Final weights obtained in Catalonia.

How we got the final priority ranking

So as to obtain the final priority ranking, first of all, scores were given to each opportunity and then the different weights obtained were applied (Annex 2).

3. Opportunities ranking

The following tables present the opportunities identified for each sector. More details on the opportunities can be found in the Opportunities reports, in the CircE tools, in the Synoptic report and in the reports regarding each opportunity (available only in Catalan).

Opportunities: textile sector	
	Increase the capacity of post-consumer textile collection *This opportunity focuses on the potential of increasing the availability of materials of post-consumer fashion and home textiles, by implementing selective collection and effective sorting systems that allow and facilitate a further retention of the value of the products in a closed loop.*
	Increase the reciclability, recycling and the use of recycled fibres, threads and fabrics *Beyond guaranteeing its collection, the recovery of textile waste (both pre-consumer and post-consumer) has to go with an improved channeling of these material inputs into assets that can be transformed into new products by other players in the value chain, with a minimum market viability.*
	Scale up the creation of new business models *Digital technologies facilitate the creation of new business models which are revolutionising the way we relate to each other whether as individuals, users or consumers, and also in the way we produce. In fat, the impact of the new digital tools is larger in those business models that move from the product itself to its use as a service.*
	Intensify the search of alternatives to prevent the effects of microfibre release and other substances of concern during the product lifecycle The textile sector is an unintentional responsible for the release of 72.000 to 138.000 tonnes of microfibres annually *to the maritime environment, originated in the use and maintenance phase of clothes and synthetic fabrics, thus, in a very quotidian and massive act such is laundering clothes made of polyester, nylon and acrylic fibres, which are present in a large amount of products and represent a significant share in the textile market.*
	Increase savings and water and energy efficiency used during the production process *The industry needs the intensive consumption of energy and water in order to maintain its activity, and for the creation and marketing of their products. One of the textile industry's main trends is the implementation of more efficient process: reducing consumption, increasing efficiency in its use, and promoting reuse when possible*
	Explore new ways of upcycling pre consumer textile waste for industrial uses *Te textile sector in Europe produces a significant amount of textile waste from its own production process, which has the potential to be circularised back in the system again, as by-products for other industries, or valorised by treating and integrating them in production processes of other industries of the sector, or in other value chains.*
	Ecodesign for durability *Taking into account the exponential increase of the consumed clothes and the dramatic reduction of the time of use of these products, the sector needs to set a future horizon which aspires to reduce the pressure on raw materials, decelerating this product rotation and betting on a consumption model that extends as much as possible the durability of clothes.*

Table 4: Opportunities identified for the textile sector in Catalonia.

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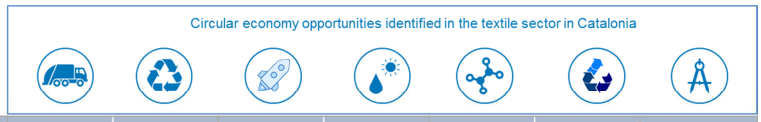
Opportunities: beverage sector	
	Preventing food waste along the value chain *Beverage manufacturers are able not only to implement actions to prevent food waste in their production process but also they can be protagonists in preventing food waste in the food value chain: redirecting resources to feed people and animals, as they have the capacity to transform and preserve a set of food products into new formats.*
	Minimising material use for beverage distribution *In order to develop a more circular productive model, beyond ensuring that the product and material flows do not leave the loop, the preferred option in managing waste is the one focused on practices that do not generate waste or generate waste as less as possible.*
	Increase the reuse of glass packaging *The reuse of resources has a preferential position in the waste hierarchy and the principles of the circular economy. Reuse allows to create strategies that move the linear industrial model towards a more efficient management of assets, minimising environmental impact, and reducing the need to maintain redundant processes.*
	Increase water savings and water efficiency during production *Among other aspects, the circular economy provides a new model for the management of resources and raw materials. It allows a new future scenario fort the industry where waste waters cease to exist or get minimised as much as possible. It provides the possibility to close the water loop in the production process, maximising its use cycles (both reducing consumption and treating it for its reuse).*
	Scaling the creation of new valuable industry products from by-products *The large volume of organic waste produced by the beverage sector generate several problems in its management and treatment. On the other hand, these by-products and waste can be transferred to other sectors or treated to create new valuable products, generating new economic and social opportunities.*
	Use of recycled packaging materials *Recycling is a necessary but not sufficient condition to create a circular economy. Recycling is a minimum and essential condition to maintain material flows inside the system, and also prevents those materials to move from the technical to the natural cycle, as negative externalities to the environment.*
	Use of biobased and/or compostable materials for plastic packaging where beneficial *There are prioritary strategies such as prevention, reuse, recycling of conventional plastics. However, the Ellen MacArthur Foundation also highlights that these processes are not yet enough taking into account the future global demand levels that plastic production will not meet. In this sense, separating plastics from its fossil base represents an interesting case to consider in certain contexts.*
	Increase the implementation of smart packaging solutions *Smart applications such as Radio frequency identification (RFID) and the creation of new applications such as the near field communication technologies (NFC) trasform the package into an important asset for improving market knowledge and accelerating the transition to circular supply chains.*

Table 5: Opportunities identified for the beverage sector in Catalonia.

On the other hand, the barriers identified for the opportunities defined for each sector are the following:

Barriers: textile sector



Barriers	Area	Post consumer collection	Recycled materials	Business models	Microfibres and substances	Energy and water	Industrial waste	Ecodesign for durability
Economic	Profit							
	Capital							
	Costs							
Regulatory	Regulatory framework							
	Government suoport							
Social	Business culture							
	Customers and society							
Market failures	Externalities							
	Business competition							
	Business ecosystem							
Business	Governance							
	Additional costs							
Technology and knowledge	Accessibility							
	Skills							

Barriers: beverage sector

Barriers	Area	Food waste	Use of materials	Glass reuse	Water use	Valorisation	Recycled material	Bioplastics	Digital Tech
Economic	Profit								
	Capital								
	Costs								
Regulatory	Regulatory framework								
	Government suoport								
Social	Business culture								
	Customers and society								
Market failures	Externalities								
	Business competition								
	Business ecosystem								
Business	Governance								
	Additional costs								
Technology and knowledge	Accessibility								
	Skills								

Table 6 and 7: Barriers identified per Opportunity for the Textile and the Beverage sectors.

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Applying the CircE AHP and considering how the barriers identified for each opportunity impact on the prioritization process, the priorities obtained are put forward in the following table:

Opportunities - Textile sector	Strategic impact	Economic impact	Social impact	Environmental impact	Score
Increase the capacity of post-consumer textile collection	8,32	8,42	8,74	7,78	8,237
Increase the reciclability, recycling and the use of recycled fibres, threads and fabrics	8,77	8,08	6,3	8,43	8,059
Explore new ways of upcycling pre consumer textile waste for industrial uses	7,94	8,12	7,64	7,59	7,809
Scale up the creation of new business models	8	6,36	8,36	7,23	7,450
Ecodesign for durability	6,79	5,68	6,18	7,56	6,698
Intensify the search of alternatives to prevent the effects of microfibre release and other substances of concern during the product lifecycle	6,8	6,12	6,3	6,45	6,445
Increase savings and water and energy efficiency used during the production process	5,67	7,12	4,64	7,29	6,344
Opportunities - Beverage sector	**Strategic impact**	**Economic impact**	**Social impact**	**Environmental impact**	**Score**
Preventing foodwaste along the value chain	8,16	8,06	8,96	7,91	8,204
Increase the reuse of glass packaging	8,02	8,8	8,08	7,73	8,107
Use of recycled packaging materials	7,28	6,98	6,88	8,41	7,525
Increase the implementation of smart packaging solutions	7,62	6,44	7,06	6,50	6,889
Minimising material use for beverage distirbution	8,14	6,56	2,78	7,56	6,635
Increase water savings and water efficiency during production	6,73	6,28	4,12	7,74	6,500
Scaling the creation of new valuable industry products from by-products	6,78	6,32	6,7	5,45	6,223
Use of biobased and/or compostable materials for plastic packaging where beneficial	4,11	4,6	3,5	4,95	4,391

Table 8: Final priority ranking.

Since the different scores obtained by the opportunities identified range from 8,237 to 6,344 in the textile sector and 8,204 to 4,391 in the beverage sector, opportunities have been grouped into three typologies:

- Opportunities set as top priorities in the agenda: Those with scores above 7 (in green).
- Opportunities to be prioritized when possible: Those with scores between 7-5 (in blue).
- Opportunities that need further assessment: Those with scores below 5 (in yellow).

Finally, and in order to share these results with the different units from the Catalan Government that have responsibilities in the field of circular economy, a meeting was set on the 24th of July. The opportunities prioritized were presented, as well as the next steps of the CircE project. Although the discussion focused mainly on the next steps of the project, it is worth mentioning here that all attendees were highly impressed by the methodology of prioritization and expressed their interest in having more information on how to apply it.

4. The Stakeholders

Beverage sector:

During the meeting held on the 21st of June, SHs from the beverage sector pointed out that:

- They currently address process improvements and innovation related to packaging weight reduction, water efficiency and waste valorisation since they all have a direct impact on companies' economic results.
- Glass packaging reuse and bioplastics are not on the sector's agenda since the costs of deposit-refund systems (DRS) for companies are considered to be unknown and the regulation and the technical performance of bioplastics are perceived as being uncertain.
- The sector by itself is capable to undertake improvements concerning material reduction, water efficiency or smart packaging solutions, whereas governmental support is needed to facilitate packaging reuse, recycling and valorisation.
- The timescale needed to spread the opportunities presented is very much in line with the level of interest of industry: opportunities being currently developed by companies (material reduction, water efficiency and waste valorisation) will spread more easily. On the contrary, those that are considered 1) to have more market barriers (such as bioplastics and smart packaging) or 2) to require a new regulatory framework or changes in consumer's mental frameworks (such as glass packaging reuse) will require a longer timescale.
- Opportunities with more CE transformation potential are those related to the creation of new products from waste valorisation, packaging reuse and the implementation of smart packaging solutions.
- Opportunities with a higher social impact are those that allow socializing benefits. Preventing food waste[2], packaging reuse, improving the availability of recycled material for packaging, and even smart packaging solutions (to improve communication between brands and consumers) as those opportunities with a highest social impact.
- The level of replicability is difficult to assess. The sector will make efforts to spread opportunities such as smart packaging solutions or waste valorisation once feasibility is proved. In the case of opportunities such as packaging reuse, replicability is seen as a must, since a partial implementation of DRS would not be advisable.
- Technology is well developed to implement opportunities such as preventing food waste, water efficiency and decreasing packaging weight. Technology is still not ready to provide adequate bioplastics. Other opportunities generate some doubts, such as glass reuse, for which some solutions are needed with regards to self-adhesive glues for labels, temperature changes, packaging thickness to avoid breakings, improvements in inverse logistics, etc.).

[2] It is worth stating here that one of the SH mentioned that the beverage sector could be considered a solution to food waste.

Textile sector:

SHs from the textile sector emphasized that:

- Their main foci of interest are those opportunities regarding energy and resource efficiency, alternatives to polluting substances and new ways of upcycling pre-consumer textiles. However, the rest of the opportunities presented are also interesting for the sector due to the scope and diversity of the value-chain and the potential SHs to be involved. In fact, improving post-consumer textiles' collection so as to increase their availability would be a priority for SH concerning recovery, reuse or recycling. The least interesting opportunity would be that related to new business models.
- The sector has very little capacity to boost on its own most opportunities, except for those related to energy and water efficiency. The need of governmental support is especially critical in the case of the implementation of alternatives to polluting substances, the prevention of microfibers release and the establishment of efficient post-consumer textiles' collection systems.
- The timescale is short in the case of resource efficiency (which is currently being undertaken by companies), the use of less polluting substances (since it is already involving a lot of technological innovation) and the introduction of recycled materials into new products. The development of new business models or eco-desing for durability would entail longer timescales (since fast fashion is prevailing nowadays). However, those two last opportunities are considered to be the most disruptive together with the development of post-consumer textiles' collection systems that make feasible the introduction of recycled textiles into new products.
- All innovations regarding circular economy in the textile sector have a quick social impact. Nevertheless, the highest social impact would be obtained developing opportunities such as new business models, eco-design for durability, improving post-consumer textiles' collection and alternatives to polluting substances.
- Opportunities with the highest level of replicability are those related to energy and water efficiency and reintroduction of recycled materials into new products. The opportunity regarding new business models also has a high level of replicability once its feasibility is proved.
- Lack of technology development is not an obstacle for the development of any of the opportunities. Technology is quickly evolving in the fields of fibres and materials' recovery, recycling and reintroduction into new products.

Annex 1

	STRATEGIC	0,265	ECONOMIC	0,219	SOCIAL	0,181	ENVIRONMENTAL	0,335	
LOCAL	Replicability	15	Initial investment	38	New Skills	26	Emissions saved	25	
	Time-scale	10	ROI	32	Public awareness	22	Energy efficiency	30	
	Coherence RIS3CAT	23	Payback	30	Social Inclusion	20	Resource efficiency	45	
	CE Transformation potential	27			Job creation	32	Res. eff. *Volum saved*		*75*
	Need of government support	25					Res. eff. *Strategic resource saved*		*25*

	STRATEGIC	0,265	ECONOMIC	0,219	SOCIAL	0,181	ENVIRONMENTAL	0,335	
GLOBAL	Replicability	0,040	Initial investment	0,083	New Skills	0,047	Emissions saved	0,084	
	Time-scale	0,027	ROI	0,070	Public awareness	0,040	Energy efficiency	0,101	
	Coherence RIS3CAT	0,061	Payback	0,066	Social Inclusion	0,036	Resource efficiency	0,151	
	CE Transformation potential	0,072			Job creation	0,058	Res. eff. *Volum saved*		*0,113*
	Need of government support	0,066					Res. eff. *Strategic resource saved*		*0,038*

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Annex 2

BEVERAGE SECTOR

Opportunities	Strategic impact					Economic impact			Social impact				Environmental Impact				
	Replicability	Time-scale	Coherence with RIS3CAT	CE Transformation	Need of government support	Initial investment	Payback time	RoI	New skills	Public awareness	Social inclusion	Job creation	Emissions saved	Energy efficiency	Resource volume saved	Strategic resource saved	
	0,040	*0,027*	*0,061*	*0,072*	*0,066*	*0,083*	*0,070*	*0,066*	*0,047*	*0,040*	*0,036*	*0,058*	*0,084*	*0,101*	*0,113*	*0,038*	TOTAL SCORE
FOODWASTE PREVENTION	7	9	9	7	9	9	7	8	6	10	10	10	9	5	9	10	8,204
MATERIAL USE REDUCTION	7	7	7	8	10	10	10	6	7	9	7	9	6	8	9	7	8,107
GLASS REUSE	9	7	9	8	4	7	6	8	7	7	8	6	8	9	9	6	7,525
WATER EFFICENCY	8	4	8	9	7	8	5	6	9	8	2	8	5	7	7	7	6,889
NEW PRODUCTS FROM WASTE VALUATIOI	9	10	7	9	7	5	8	7	2	5	1	3	7	7	9	6	6,635
USE OF RECYCLED MATERIAL INTO NEW P	10	10	7	6	4	6	5	8	6	4	2	4	5	10	7	10	6,500
USE OF BIOBASED PLASTICS	7	5	8	7	6	6	7	6	9	6	4	7	5	5	6	6	6,223
SMART PACKAGING SOLUTIONS	6	4	2	5	4	8	3	2	4	5	2	3	6	4	5	5	4,391

TEXTILE SECTOR

Opportunities	Strategic impact					Economic impact			Social impact				Environmental Impact				
	Replicability	Time-scale	Coherence with RIS3CAT	CE Transformation	Need of government support	Initial investment	Payback time	RoI	New skills	Public awareness	Social inclusion	Job creation	Emissions saved	Energy efficiency	Resource volume saved	Strategic resource saved	
	0,040	*0,027*	*0,061*	*0,072*	*0,066*	*0,083*	*0,070*	*0,066*	*0,047*	*0,040*	*0,036*	*0,058*	*0,084*	*0,101*	*0,113*	*0,038*	TOTAL SCORE
POST CONSUMER COLLECTION	9	7	7	8	10	10	6	9	6	9	10	10	8	5	10	8	8,236795
RECYCLING; USE OF RECYCLED MATERIAL & REC	8	8	9	10	8	9	8	7	7	8	4	6	7	8	10	8	8,059195
NEW BUSINESS MODELS	6	6	10	10	6	7	5	7	10	10	5	8	7	7	8	6	7,449875
MICROFIBRES & SUBSTANCES OF CONCERN	7	5	7	7	7	8	4	6	9	8	3	5	9	5	6	6	6,44508
WATER AND ENERGY EFFICIENCY	8	8	8	4	3	9	5	7	6	4	3	5	5	10	6	9	6,3444325
PRE CONSUMER UPCYCLING	8	7	7	9	8	10	6	8	8	4	9	9	8	7	8	7	7,8094325
ECODESIGN FOR DURABILITY	6	6	7	9	5	6	5	6	7	8	5	5	7	7	9	6	6,6984375

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