Business models and business plans

Deliverable 7.6

Author: CITEVE

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Contributors	
Main Contributor	Paulo Cadeia (CITEVE)
Contributors	Helena Vilaça (CITEVE), Renato Mortera (PROPAGROUP), Davide Crapanzano (PROPAGROUP), Mario Kröger (NORA), Sandra Fernandes (RIOPELE), Ângela Teles (RIOPELE), Albertina Reis (RIOPELE)

Control Sheet			
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List of Abbreviations

Acronyms	Description
B2B	Business to Business
B2C	Business to Consumer
CAGR	Compound Annual Growth Rate
D	Deliverable
EU	European Union
EVA	Ethylene-Vinyl Acetate
GA	Grant Agreement
IPR	Intellectual Property Rights
KER	Key exploitable results
LDPE	Low-density Polyethylene
PHA	Polyhydroxyalkanoate
PLA	Polylactic Acid
R&D	Research and Development
RIA	Research and Innovation Action
SEO	Search Engine Optimization
SWOT	Strengths, weaknesses, opportunities and threats
T	Task
TRL	Technology Readiness Level
UV	Ultra-violet
VC	Value-chain
W2BC	**Waste2BioComp**

1. Introduction

The overall objective of T7.5 – Benchmarking, Business plans and exploitation strategy for the bio-based materials is to develop the project's exploitation strategy, realised by market analyses, benchmarking and technology watch, and business models and business plans for commercialization of the products developed in the three value-chains (VC). Related to this exploitation, the Work Package includes innovation management, which encompasses Intellectual Property Rights (IPR) management and Open Science matters, which are presented in deliverables D7.11 - Data management plan – final, and D7.3 - Report on the IPR activities.

Along with this report, the Plan for the dissemination and exploitation including communication activities - final (D7.10) demonstrate the project's exploitation strategy.

In detail, this document consists of the presentation of the business models and business plans for each of the VCs – footwear (bio-based insoles), packaging (bio-based flexible films) and textile (technical textiles for sportswear).

This report, together with D7.4 and D7.9 (Reports on benchmarking and technology watch), shows the accomplishment of *Milestone 10 – Realist business strategy*, by presenting an objective market analysis to confirm the feasibility of the envisaged business strategy for the three VCs – footwear, packaging and textile.

2. Business models and business plans

Tailor-made business models for each of the VCs (footwear, packaging and textile) were created, with a high exploitation potential with selected Key Exploitable Results (KER). Such business models will be able to help to define future exploitation plans and are aligned with the main overall exploitation strategies of each partner within their organization.

The business models serve as this fundamental blueprint, outlining the core logic of organization's operations and its interactions within the market. However, to effectively analyse, design, and innovate upon these models, a structured approach is necessary. This chapter lays the structure of the 'business model framework" that is presented for each of the VCs.

The key points considered for each Business Model will be presented trough these segments:

1. CANVAS implementation: Briefly explain its nine building blocks.
2. Identification of product segment
3. Market study: Identification of potential markets and client segment; Suppliers identification and competitors; Identification of a realistic value proposition of each one of the products offered to the customer and its return
4. Identification of the commercialization channels and communication processes
5. Sales forecast
6. Definition of the necessary investments to implement the activity
7. Costing assessment for each product: determination of product cost, raw materials, human resources, indirect costs, etc.
8. Investigating the different potential revenue streams such as selling products, services, licensing formulation and process recipes and outsourcing
9. Final SWOT Analyses

The structure provides a way of thinking about the framework and analysing the business models. By establishing a solid understanding of those frameworks, we set the stage for a more in-depth exploration and application of specific models in the subsequent sections of this work.

In that sense, the presented business models and business plans collected inputs from a financial analysis of each of the components that encompass the sales outlook for the coming years as well as the initial investments required for the three VCs, associated costs and the expected break-even point. Short analyses for each of these components are presented in different following sub-chapters.

Upon the identification of the Value Propositions and Revenue Streams, individual solutions for each product concerning target markets and key activities for successful business development were established, as well as the Break-Even Point for each one. The defined solutions will allow to direct each products' market efforts to the most suitable market sector, namely to the secondary and tertiary markets.

2.1. Footwear VC

In this section the business model for the footwear VC, considering the **W2BC** results, was developed.

2.1.1. Business model framework definition

The business model framework for the **W2BC** project is structured around the transition from fossil-based shoe insole-foam materials to biodegradable, bio-based alternatives.

This business model supports the **long-term viability of bio-based insoles and insole foam materials**, helping accelerate the market uptake of bio-based alternatives in response to growing regulatory pressure and consumer demand for sustainability.

2.1.2. Business canvas

The business canvas analysis presented below summarises the business approach followed by **W2BC** for the footwear VC.

<table>
<tr><th>KEY PARTNERS</th><th>VALUE PROPOSITION</th><th>COSTUMER RELATIONSHIP</th></tr>
<tr><td>• PHAs producers
• Foaming technology developers
• (Medical) footwear producers
• Patients</td><td rowspan="2">• Innovative and sustainable bio-based foam for insoles
• High comfort bio-based three-layered insoles for medical footwear
• Currently used foaming technology, that do not requires companies to make significant changes in the production lines
• Social and socioeconomic benefits
• Contribution to international standards for bio-based materials</td><td>• Social media presentation of finalised and certified products
• B2B meetings on footwear and medical fairs
• Technical and commercial conferences</td></tr>
<tr><th>KEY ACTIVITIES</th><th>CUSTOMER SEGMENT</th></tr>
<tr><td>• Technology optimization
• Marketing and business strategies development
• Environmental consulting services for biomaterials and footwear
• Citizen acceptance monitoring
• Regulatory monitoring</td><td rowspan="2">• Research organizations
• End users: footwear producers, patients requiring medical insoles for their footwear
• Engineering and consultancy companies
• Entrepreneurs, spin-offs, start-ups</td></tr>
<tr><th>KEY RESOURCES</th><th>CHANNELS</th></tr>
<tr><td>• PHA foams with different hardness
• Technical and financial capability
• Effective dissemination and marketing plan
• Know-how and IP
• Presence in the EU R&D community
• Continuous R&D activities</td><td>• B2B sales
• B2C sales</td></tr>
<tr><th colspan="2">COST STRUCTURE</th><th>REVENUE STREAMS</th></tr>
<tr><td colspan="2">• Business and marketing services
• Manufacturing</td><td>• Bio-based insoles sales
• Technology licenses and fees</td></tr>
</table>

• Logistics (transport and shipment) • Raw materials	

2.1.3. Identification of product segment

NORA's EVA based foams for shoe insoles are sold into the medical care industry, for example to orthopaedic shoemakers and larger companies that are producing shoe insoles. Main market is the EU.

The segment of the PHA based insoles is the same as the current that NORA has for the EVA insoles. The goal is to replace the EVA insoles by the PHA based ones.

2.1.4. Market study

A benchmark analysis and technology watch were carried out and are presented in Deliverable D7.9 - Report on benchmarking and technology watch – final. This is a public deliverable which was also published on the ECOSYSTEX website.[1] In there is presented a list of solutions available on the market in the footwear VC containing bio-based shoe soles and insoles. This search allowed to conclude that although there are some bio-based soles and insoles in the market, these solutions do not compete directly with the insoles developed in **W2BC**, as the solutions available have only a small percentage of bio-based content, and most have a performance not suitable for high-demanding technical applications, such as medical, as the ones developed within the project.

In terms of market size, the current shoe market has a size of 100 billion € in the EU and 350 billion € worldwide. NORA estimates the market for foam-based insoles to be about 100 million € in the EU and 300 million € worldwide. Given NORA positioning in the premium section of this market, the potential of **W2BC** results for NORA business is a bit more limited, but then again, costumers appreciate innovations and are more likely to accept higher prices for improved sustainability – based on market surveys. NORA predicts that, even if **W2BC** materials were slightly more expensive than existing EVA solutions, there is a mid-term potential for additional business of 1 million €. When prices achieve the same level as current standard materials, 10 million € would be realistic.

2.1.5. Commercialization channels and communication processes

Commercialization could be done via the existing NORA sales channels and sales force. This includes both B2B and B2C using the website.

Communication would be done via known channels like expert media, trade fairs, sales activities, scientific articles, but also online media.

For business-to-business sales of bio-based foam, direct and relationship-driven communication channels are crucial. These include:

- Direct Sales Team: A dedicated sales force engaging directly with potential business clients (e.g., shoemakers). This involves in-person meetings, presentations, and tailored solutions.
- Industry Trade Shows and Conferences: Participating in relevant industry events to showcase products, network with potential buyers, and build brand awareness within the sector.
- **Key Account Management:** Establishing strong, long-term relationships with significant clients through dedicated account managers who provide ongoing support and identify new opportunities.

[1] https://static1.squarespace.com/static/666b018c0edddc61de8d4e7c/t/67598bbe5210120051a6dd57/1733921727259/D7.9_M30_Task7.5.1_v1.pdf

For business-to-consumer sales of bio-based insoles through a website, digital and accessible communication channels are paramount:

- Company Website: The central hub for product information, specifications, pricing, and online ordering. High-quality product descriptions, images, and videos are essential.
- Search Engine Optimization (SEO): Optimizing website content to rank highly in search engine results when consumers search for insulation solutions.
- Social Media Marketing: Engaging with potential customers on relevant social media platforms to build brand awareness, share educational content about sustainable insulation, and drive traffic to the website.
- Email Marketing: Building an email list and sending targeted campaigns to inform subscribers about new products, promotions, and the benefits of bio-based insulation.

2.1.6. Sales forecast

Figure 1 outlines the forecast projected revenues for three distinct services from 2027 to 2033, along with a "Growth Perspective" section illustrating potential total revenue under different growth scenarios.

		Grow prepective						
		100%	90%	80%	60%	40%		
Revenue Forecast / Services	Unit Price	Expected sales						
		2027	2028	2029	2030	2031	2032	2033
Bio-based foam sales B2B	25 €	100	1000	2000	3800	6840	10944	15322
Bio-based insolate sales B2C via website	130 €	0	50	100	190	342	547	766
Technology licence & fees (sells)	- €	0	1	2	0	1	0	0
					TOTALS			

Revenue Forecast / Services	Total						
	2027	2028	2029	2030	2031	2032	2033
Bio-based foam sales B2B	2,500 €	25,000 €	50,000 €	95,000 €	171,000 €	273,600 €	383,040 €
Bio-based insolate sales B2C via website	- €	6,500 €	13,000 €	24,700 €	44,460 €	71,136 €	99,590 €
Technology licence & fees (sells)	- €	- €	- €	- €	- €	- €	- €
TOTALS	2,500 €	31,500 €	63,000 €	119,700 €	215,460 €	344,736 €	482,630 €

*Figure 1 Forecast projected revenues for three distinct services from 2027 to 2033, along with a "Growth Perspective", for the bio-based insoles of **W2BC**.*

Bio-based foam sales B2B: With a unit price of 25 €, this segment shows substantial growth in unit sales over the forecast period, increasing from 100 units in 2027 to 15 322 units in 2033. This translates to a significant increase in revenue, starting at 2 500 € in 2027 and reaching 383 040 € by 2033. This indicates a strong projected demand and market penetration for the B2B bio-based foam product.

Bio-based insolate sales B2C via website: Priced at 130 € per unit, this segment starts with modest sales in 2027 and demonstrates steady growth through the website channel, reaching 766 units sold and 99 580 € in revenue by 2033. While the unit price is higher, the growth in volume is less aggressive compared to the B2B foam sales.

The "Total" revenue row sums the revenue from all three services. It shows a strong upward trend, increasing from 2 500 € in 2027 to an impressive 482 620 € by 2033. This growth is primarily driven by the significant expansion in bio-based foam sales (B2B).

The table suggests a very positive growth trajectory, primarily powered by the B2B sales of bio-based foams. While the B2C sales of bio-based insulation contribute to the overall revenue, the B2B segment is the major growth driver. The "Growth perspective" provides a valuable sensitivity analysis, highlighting the potential impact of deviations from the initial growth projections. The negligible contribution from technology licensing suggests this area may not be a significant focus for future revenue generation based on these projections.

2.1.7. Necessary investments to implement the activity

NORA considers that it is not necessary to make initial investments, in addition to those already covered by the development of the **W2BC** project.

2.1.8. Costing assessment

Figure 2 breaks down the forecasted operational costs for the insoles, taking the year of 2024 as basis. It outlines various cost categories, the percentage each category contributes to the overall solution cost, and the corresponding monetary value.

Operation costs	Value
Eletricity + water + gases + etc.	2,500.00 €
Raw materials	25,000.00 €
Subcontrating	5,000.00 €
Other operational costs	5,000.00 €
Marketing & Comunication	2,000.00 €
TOTAL FSE 2024	**39,500.00 €**

	Average salary	ETI	
Human Resources for the project (average salary)	3,000.00 €	2.50	7,500.00 €

TOTAL OPERATIONAL COSTS + HUMAN RESOURCES (YEAR) - FORECAST	**47,000.00 €**

Figure 2 Forecasted operational costs for the bio-based insoles.

Operation Costs:

- Electricity + water + gases + etc.: This category represents a small portion of the total operational costs, which we consider the value of 2 500 €.
- Raw materials: This constitutes the most significant operational cost, which represents around 70% of the operational cost here presented (25 000 €). This highlights the importance of raw material sourcing and potential cost optimization in this area.
- Subcontracting: a value of 5 000 € is consider for outsourcing any specific tasks or processes.
- Other operational costs: Those operational costs reflets costs not included in the other lines like daily maintenance, depreciation of equipment and other indirect costs for example.
- Marketing & Communication: with a low amount we consider this as a crucial area for business development, with a value of 2 000 €, and related with promotion of the solution.

The sum of all listed operation costs amounts to 39 500 €, representing the total forecasted operational expenses (taking 2024 as basis), excluding human resources. Adding the human resources forecast, we'll have, with an average monthly salary of 3.000 € per person allocated to this product and a suggestion 2.5 full-time employees dedicated to the project, resulting in a total human resource cost of 7.500 € for the year.

As a remark, we should take in consideration the operational costs are heavily influenced by raw material expenses category.

Human resources represent a notable additional expense, bringing the total forecasted cost for the solution (taking in basis the calculation for 2024) to 47 000 €.

2.1.9. Potential revenue streams

Figure 3 presents a financial feasibility study spanning ten years, from 2024 to 2033, with a reference period of 10 years (likely indicating a base year for calculations, although its direct use isn't immediately obvious in the displayed data). The study uses an annual interest rate of 4.00% for discounting future cash flows.

This feasibility study suggests that the exploration project is projected to become financially viable in 2030, starting in 2027. While there are initial operating costs, the anticipated revenue growth significantly outweighs these expenses in the later years. The positive and increasing "Cash Flows

Accumulated and Updated" indicate that, considering the time value of money at a 4.00% discount rate, the project is expected to generate a substantial net positive return over the ten-year period. The final accumulated and updated cash flow of 993 495 € in 2033 suggests a potentially attractive investment opportunity, assuming the revenue and cost forecasts are accurate.

Reference period	**10**	
Interest Rate	**4.00%**	year

year		Investments	Forecast of Exploration Operating Costs	Revenue Forecast	TA	Updated Exploration Costs	Updated Exploration Revenues	Cash Flows	Cash Flows Accumulated and Updated
2024	0		- €	- €	1.00	**- €**	**- €**	- €	**- €**
2025	1		- €	- €	0.96	**- €**	**- €**	- €	**- €**
2026	2		- €	- €	0.92	**- €**	**- €**	- €	**- €**
2027	3		47,000 €	2,500 €	0.89	**47,000 €**	**2,500 €**	2,500 €	**- 44,500 €**
2028	4		47,000 €	31,500 €	0.85	**40,176 €**	**31,500 €**	- 15,500 €	**- 53,176 €**
2029	5		47,000 €	63,000 €	0.82	**38,631 €**	**63,000 €**	16,000 €	**- 28,806 €**
2030	6		47,000 €	119,700 €	0.79	**37,145 €**	**119,700 €**	72,700 €	**53,749 €**
2031	7		47,000 €	215,460 €	0.76	**35,716 €**	**215,460 €**	168,460 €	**233,493 €**
2032	8		47,000 €	344,736 €	0.73	**34,342 €**	**344,736 €**	297,736 €	**543,886 €**
2033	9		47,000 €	482,630 €	0.70	**33,022 €**	**482,630 €**	435,630 €	**993,495 €**

Figure 3 Financial feasibility study spanning ten years, from 2024 to 2033, for the bio-based insoles.

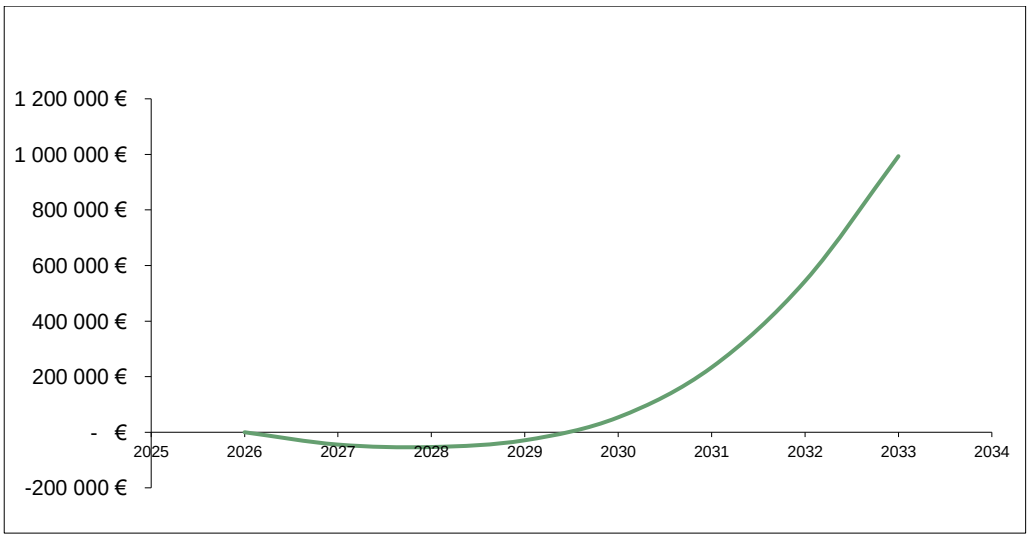

Figure 4 Cash flows spanning ten years, from 2024 to 2033, for the bio-based insoles.

2.1.10. Final SWOT Analysis

Positive	Internal		Negative
	Strengths	**Weaknesses**	
	+ Lower dependence on petroleum-based insoles + Sustainability, legislations & policies related to bioeconomy and green products + Insoles with high added-value and advanced technology + Increased know-how on the manipulation of bio-based materials + Biodegradable and non-toxic insoles + Improved comfort and safety of the insoles	- Adapting existing packaging technologies and processes to PHAs has led to technical challenges in terms of material processing and end-use performance, necessitating the use of other bio-based materials (i.e. bio-EVA) as enablers - Still limited production of raw materials (PHAs) for the up-scale of the insole foams manufacturing	
	Opportunities	**Threats**	
	+ Increasing global concern on manufacturing industries environmental impact + Increased demand for safe & sustainable products + New product synergies and market opportunities + Improvement of bio-based materials performance + Emerging market and end-user companies + EU guidelines concerning sustainable industry	- New patents with other PHA-based soles / insoles - Final cost of the developed products too high - Production of PHA raw material not meeting the needs for the foams production - Not enough policies and measures to support bio-based materials - Targeted markets resistance to new solutions	
	External		

2.2. Packaging VC

In this section the business model for the packaging VC, considering the **W2BC** results, was developed.

2.2.1. Business model framework definition

The business model framework for the **W2BC** project is structured around the transition from fossil-based flexible packaging materials to fully compostable, bio-based alternatives.

This business model supports the **long-term viability of bio-based packaging solutions**, helping accelerate the market uptake of compostable alternatives in response to growing regulatory pressure and consumer demand for sustainability.

2.2.2. Business canvas

The business canvas analysis presented below summarises the business approach followed by **W2BC** for the packaging VC.

<table>
<tr><th>KEY PARTNERS</th><th>VALUE PROPOSITION</th><th>COSTUMER RELATIONSHIP</th></tr>
<tr><td>• PHAs producers
• Blown extrusion technology developers
• Flexible plastic films producers
• Industry that uses flexible films</td><td rowspan="2">• Innovative and sustainable bio-based plastic films for packaging
• Fully compostable multi-layer films tailored for packaging applications
• Circular solutions replacing fossil-based plastics in flexible packaging
• Currently used blown extrusion technology, that do not require companies to make significant changes in the production lines
• Promotes social inclusion and socioeconomic sustainability
• Supports the development and harmonization of international standards for bio-based packaging materials</td><td>• Social media presentation of finalised and certified products
• B2B meetings on plastic and packaging fairs
• Technical and commercial conferences
• Technical support and co-development with converters
• Partnership-driven innovation with B2B clients</td></tr>
<tr><th>KEY ACTIVITIES</th><th>CUSTOMER SEGMENT</th></tr>
<tr><td>• Technology optimization
• Marketing and business strategies development
• Environmental consulting services for biomaterials and packaging
• Citizen acceptance monitoring
• Regulatory monitoring
• Pilot testing and material validation at industry scale
• LCA and end-of-life assessments to demonstrate compostability and impact</td><td rowspan="2">• Research organizations
• End users: industrial users and converters of plastic films seeking sustainable alternatives
• Engineering and consultancy companies
• Entrepreneurs, spin-offs, start-ups
• Retailers and brands committed to eco-friendly packaging
• Policy-driven procurement (e.g., municipalities, public catering)</td></tr>
<tr><th>KEY RESOURCES</th><th>CHANNELS</th></tr>
<tr><td>• Biodegradable flexible PHA films
• Technical and financial capability
• Effective dissemination and marketing plan
• Know-how and IP</td><td>• B2B sales
• B2C sales
○ Cross-channel marketing</td></tr>
</table>

• Presence in the EU R&D community • Continuous R&D activities • Access to pilot infrastructure and specialized R&D teams • Strong consortium with academic and industrial expertise		
COST STRUCTURE	**REVENUE STREAMS**	
• Business and marketing services • Manufacturing • Logistics (transport and shipment) • Raw materials • IP ownership investments	• Revenue through cost-competitive production enabled by bio-based innovation • Bio-based flexible plastic films sales • Technology licenses and fees • Licensing of compostable formulations or processes • Premium positioning for sustainable packaging materials	

2.2.3. Identification of product segment

Flexible plastics represent a significant share of the packaging market, particularly in food & industrial packaging, personal care and household product applications. Within this segment, **W2BC** targets multi-layer films traditionally based on LDPE and other fossil-based resins. The focus is on replacing these with fully compostable, bio-based alternatives suitable for flow packs, pouches, wrapping films, etc. The selected product segment is characterized by high volumes, short life cycles, and increasing regulatory pressure—making it ideal for sustainable innovation.

2.2.4. Market study

A benchmark analysis and technology watch were carried out and are presented in Deliverable D7.9 - Report on benchmarking and technology watch – final. This public deliverable, also available on the ECOSYSTEX website, presents an overview of commercially available solutions within the packaging value chain that incorporate bio-based polyester plastics. In there is presented a list of solutions available on the market in the packaging VC containing bio-based polyester plastics. This search allowed to conclude that despite the presence of different bio-based polyesters in the market made from renewable sources, many come from sugarcane or plant-based biomass, which can compete with the food industry / agricultural areas, indicating the demand for alternative not-competing bio-based sources to produce the bio-based plastics. Also, the properties of several of the presented solutions (e.g., flexibility, durability) can be improved to increase the range of applications.

In terms of market size, the size and share of the worldwide biodegradable paper & plastic packaging market was valued around 13.3 billion in 2023 and is estimated to grow at a compound annual growth rate (CAGR) >10% to reach 31.6 billion € by the end of 2032 (source: Introspective Market Research). However, the growth of this market continues to be constrained by factors such as limited industrial-scale investment, high production costs and technological readiness of novel bioplastics.

To address these challenges, **W2BC** has developed a cost-effective approach, combining bio-based technologies with blend and multi-layer film strategies to enhance performance while maintaining sustainability. In this context, PROPAGROUP has played a pivotal role, building on its long-standing commitment to sustainable innovation. For years PROPAGROUP has been designing, engineering and bringing to market a dedicated "green product line" with low environmental impact and a sustainable use of raw materials aiming to decrease CO_2 emission and energy consumption as strongly recommended and pledged in the European Green Deal and Clean Industrial Deal The contribution of **W2BC** on PROPAGROUP business will thus result in the enlargement of its green product range, satisfying the client requirements and meeting the end-user and customer new attitude, perception and concerns.

2.2.5. Commercialization channels and communication processes

The commercialization strategy for **W2BC** flexible packaging solutions is primarily B2B, targeting converters, packaging manufacturers, and brand owners seeking sustainable alternatives to conventional films. Channels include direct sales, industry fairs and strategic partnerships with established players in the packaging value chain.

Additionally, the project leverages digital platforms, including dedicated websites, social media, and online marketplaces, to increase visibility and facilitate engagement with potential customers and stakeholders.

Communication processes are coordinated across the consortium to ensure alignment between technical validation, market readiness and regulatory compliance. Tailored communication materials (i.e., technical datasheets, environmental impact summaries and application case studies) are developed to support the uptake of the **W2BC** solutions. Participation in EU-level initiatives (like ECOSYSTEX or ECOMONDO) further reinforces dissemination and collaboration with key actors in the circular bioeconomy landscape.

2.2.6. Sales forecast

Figure 5 outlines the forecast projected revenues for three distinct services from 2027 to 2033, along with a "Growth Perspective" section illustrating potential total revenue under different growth scenarios.

		Grow prepective						
		50%	50%	50%	10%	10%		
Revenue Forecast / Services	Unit Price	expected services						
		2027	2028	2029	2030	2031	2032	2033
Bio-based film sales B2B	40 €	500	1500	2250	3375	5063	5569	6126
Bio-based film sales B2C	- €	0	0	0	0	0	0	0
Technology licence & fees (sells)	3,500 €	0	1	1	1	1	1	1
TOTALS								

Revenue Forecast / Services	Total						
	2027	2028	2029	2030	2031	2032	2033
Bio-based film sales B2B	20,000 €	60,000 €	90,000 €	135,000 €	202,500 €	222,750 €	245,025 €
Bio-based film sales B2C	- €	- €	- €	- €	- €	- €	- €
Technology licence & fees (sells)	- €	3,500 €	3,500 €	3,500 €	3,500 €	3,500 €	3,500 €
TOTALS	**20,000 €**	**63,500 €**	**93,500 €**	**138,500 €**	**206,000 €**	**226,250 €**	**248,525 €**

*Figure 5 Forecast projected revenues for three distinct services from 2027 to 2033, along with a "Growth Perspective", for the bio-based flexible films of **W2BC**.*

Bio-based film sales B2B: With a unit price of 40 €, this segment shows substantial growth in unit sales over the forecast period, increasing from 500 units in 2027 to 6.126 units in 2033. This translates to a significant increase in revenue, starting at 20 000 € in 2027 and reaching 245 025 € by 2033. This indicates a strong projected demand and market penetration for the B2B bio-based film product.

Bio-based film sales B2C: this was not considered as it is too difficult to sell this type of film to the final consumer.

From 2028 a revenue of 3 500 € is expect considering sell of licence & fees to third parties.

The "Total" revenue row sums the revenue from the two lines. It shows a strong upward trend, increasing from 20 000 € in 2027 to an impressive 248 525 € by 2033. This growth is primarily driven by the significant expansion in bio-based film sales (B2B).

2.2.7. Necessary investments to implement the activity

PROPAGROUP considers that it is not necessary to make initial investments, in addition to those already covered by the development of the **W2BC** project.

2.2.8. Costing assessment

Figure 6 breaks down the forecasted operational costs for the flexible films, taking the year of 2024 as basis. It outlines various cost categories, the percentage each category contributes to the overall solution cost, and the corresponding monetary value.

Operation costs	Value
Eletricity + water + gases + etc.	15,000.00 €
Raw materials	20,000.00 €
Other operational costs	2,000.00 €
Marketing & Comunication	10,000.00 €
TOTAL FSE 2024	**47,000.00 €**

	Average salary	ETI	
Human Resources for the project (average salary)	4,992.00 €	1.50	7,488.00 €

TOTAL OPERATIONAL COSTS + HUMAN RESOURCES (YEAR) FORECAST	**54,488.00 €**

Figure 6 Forecasted operational costs for the bio-based flexible films.

Operation Costs:

- Electricity + water + gases + etc.: This category represents a considered portion of the total operational costs - 15 000 €.
- Raw materials: This constitutes the most significant operational cost (20 000 €) which with the previous line represents around 74% of the operational. This highlights the importance of raw material sourcing and potential cost optimization in this area.
- Other operational costs: This covers costs not detailed elsewhere, including daily maintenance, small peripheral equipment, intermediate processing and indirect logistics.
- Marketing & Communication: This is a crucial area for business development accounts for which we consider a value of 10 000 € to be present in fairs and visit clients to promote the products.

The sum of all listed operation costs amounts to 47 000 €, representing the total forecasted operational expenses (taking 2024 as basis), excluding human resources. Adding the human resources forecast, we will have, with an average monthly salary of 4 992 € per person allocated to this product and a suggestion 1.5 full-time employees dedicated to the project, resulting in a total human resource cost of 7 488 € for the year.

The total forecasted cost for the solution (taking in basis the calculation for 2024) to 54 488 €.

2.2.9. Potential revenue streams

Figure 7 presents a financial feasibility study spanning ten years, from 2024 to 2033, with a reference period of 10 years (likely indicating a base year for calculations, although its direct use isn't immediately obvious in the displayed data). The study uses an annual interest rate of 4.00% for discounting future cash flows.

This feasibility study suggests that the exploration project is projected to become financially viable in 2029, starting in 2027. While there are initial operating costs, the anticipated revenue growth significantly outweighs these expenses in the later years. The positive and increasing "Cash Flows Accumulated and Updated" indicate that, considering the time value of money at a 4.00% discount rate, the project is expected to generate a substantial net positive return over the ten-year period.

The final accumulated and updated cash flow of 687 860 € suggests a potentially attractive investment opportunity, assuming the revenue and cost forecasts are accurate.

Reference period	10	
Interest Rate	4.00%	year

year		Investments	Forecast of Exploration Operating Costs	Revenue Forecast	TA	Updated Exploration Costs	Updated Exploration Revenues	Cash Flows	Cash Flows Accumulated and Updated
2024	0		- €	- €	1.00	- €	- €	- €	- €
2025	1		- €	- €	0.96	- €	- €	- €	- €
2026	2		- €	- €	0.92	- €	- €	- €	- €
2027	3		54,488 €	20,000 €	0.89	**54,488 €**	**20,000 €**	- 34,488 €	**- 34,488 €**
2028	4		54,488 €	63,500 €	0.85	**46,577 €**	**63,500 €**	16,923 €	**- 17,565 €**
2029	5		54,488 €	93,500 €	0.82	**44,785 €**	**93,500 €**	48,715 €	**31,150 €**
2030	6		54,488 €	138,500 €	0.79	**43,063 €**	**138,500 €**	95,437 €	**126,588 €**
2031	7		54,488 €	206,000 €	0.76	**41,406 €**	**206,000 €**	164,594 €	**291,181 €**
2032	8		54,488 €	226,250 €	0.73	**39,814 €**	**226,250 €**	186,436 €	**477,617 €**
2033	9		54,488 €	248,525 €	0.70	**38,283 €**	**248,525 €**	210,242 €	**687,860 €**

Figure 7 Financial feasibility study spanning ten years, from 2024 to 2033, for the bio-based flexible films.

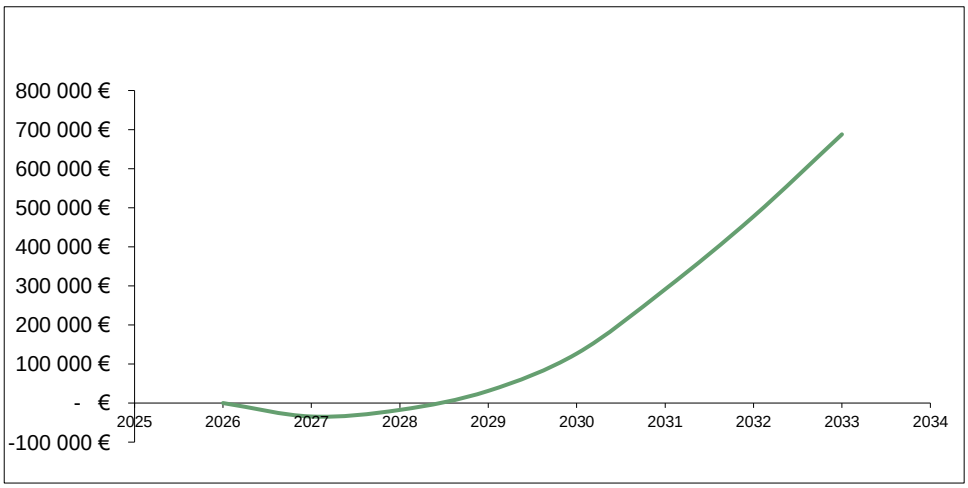

Figure 8 Cash flows spanning ten years, from 2024 to 2033, for the bio-based flexible films.

2.2.10. Final SWOT Analysis

	Internal	
Positive	**Strengths**	**Weaknesses**
	+ Lower dependence on petroleum-based products, supporting a circular economy + Sustainability, legislations & policies related to bioeconomy and green products in the packaging sector + Development of advanced bio-based materials, enabling high-performance, functional packaging with minimal environmental impact + Strategic partnerships between packaging manufacturers, R&D entities and material suppliers that enhance innovation and product development within the packaging value chain	- Adapting existing packaging technologies and processes to PHAs has led to technical challenges in terms of material processing and end-use performance, necessitating the use of other compostable materials in low amount (i.e. PLA) as enablers - Up-scaling PHAs-based flexible films production for packaging has faced some challenges mainly due to narrow PHAs processing window and poor PHAs flexibility - Raw material availability
	Opportunities	**Threats**
	+ Increasing global concern on manufacturing industries environmental impact, driving demand for sustainable and biodegradable packaging alternatives + Improved safety on packaging products + Strong potential for new product synergies and market openings, particularly in food and industrial packaging sector, which is increasingly focused on sustainable packaging + Increased interest from end-user companies and consumers in eco-friendly packaging solutions, providing market opportunities for the new bio-based materials + Alignment with EU guidelines and incentives for the development of sustainable packaging solutions in the context of the European Green Deal – Clean industrial Deal + Create higher awareness on consumers	- Competition from other initiatives or companies that may have more advanced technologies or stronger market positions in sustainable packaging - Project solutions do not present intended impact on end-users - The final cost of bio-based packaging solutions may be higher than petroleum-based alternatives, hindering widespread adoption without sufficient policy support - Not enough policies and measures to support bio-based materials - Resistance from traditional packaging sectors or from consumers who are hesitant to adopt new, unfamiliar packaging materials
	External	Negative

2.3. Textile VC

In this section the business model for the textile VC, considering the **W2BC** results, was developed.

2.3.1. Business model framework definition

The business model framework for the **W2BC** project is structured around the transition from fossil-based textile functional coating materials to bio-based alternatives.

2.3.2. Business canvas

The business canvas analysis presented below summarises the business approach followed by **W2BC** for the textile VC.

<table>
<tr><th>KEY PARTNERS</th><th>VALUE PROPOSITION</th><th>COSTUMER RELATIONSHIP</th></tr>
<tr><td>• PHAs producers
• Spray coating technology developers
• Sportswear producers</td><td rowspan="2">• Innovative and sustainable bio-based coatings for textiles
• Functional spray coated textiles for sportswear
• Currently used spray technology, that do not requires companies to make significant changes in the production lines
• Social and socioeconomic benefits
• Contribution to international standards for bio-based materials</td><td>• Social media presentation of finalised and certified products
• B2B meetings on coating and textile fairs
• Technical and commercial conferences</td></tr>
<tr><th>KEY ACTIVITIES</th><th>CUSTOMER SEGMENT</th></tr>
<tr><td>• Technology optimization
• Improve formulation
• Marketing and business strategies development
• Environmental consulting services for biomaterials and textiles
• Citizen acceptance monitoring
• Regulatory monitoring</td><td rowspan="2">• Research organizations
• Sportswear producers
• Engineering and consultancy companies
• Entrepreneurs, spin-offs, start-ups</td></tr>
<tr><th>KEY RESOURCES</th><th>CHANNELS</th></tr>
<tr><td>• Coated functional textiles for sportswear
• Technical and financial capability
• Effective dissemination and marketing plan
• Know-how and IP
• Presence in the EU R&D community
• Continuous R&D activities</td><td>• B2B sales</td></tr>
<tr><th colspan="2">COST STRUCTURE</th><th>REVENUE STREAMS</th></tr>
<tr><td colspan="2">• Business and marketing services
• Manufacturing
• Logistics (transport and shipment)
• Raw materials
• IP ownership investments</td><td>• Coated functional textiles for sportswear sales
• Technology licenses and fees</td></tr>
</table>

2.3.3. Identification of product segment

Technical textiles represent a significant share of the textile market, namely in sportswear, footwear, and other applications. Within this segment, **W2BC** targets functional spray coatings for textiles, traditionally based on fossil-based polymers and additives. The focus is on replacing these with bio-based alternatives suitable for sportswear textiles that require moisture management properties. The selected product segment is characterized by high volumes and increasing regulatory and quality standards pressure—making it ideal for sustainable innovation.

2.3.4. Market study

A benchmark analysis and technology watch were carried out and are presented in Deliverable D7.9 - Report on benchmarking and technology watch – final. This is a public deliverable which was also published on the ECOSYSTEX website.[2]

A survey on textile spray coating solutions available in the market shows that these are mostly to confer water & stain resistance, UV Protection, antimicrobial activity or flame-retardancy. Also, most of the solutions available are fossil-based, with very few alternatives from bio-based origin, although with a clear trend of these least.

In terms of coatings to confer moisture management, some solutions in the mark include Athon TX 510 Hydrophilic Agent (Athon Chemicals), HYDRA BOOST or RESIWICK PLUS (Resil Chemicals), Arristan rAir (CHT Group), HS-TC-18 (Zhuhai Hua Da Hao Hong Chemical), RUCO® 3840 (Rudolf Duraner), or Hydrophilic Agent 66302 (Bluelakechem). Most of the available solutions are based in fossil-based polymers, such as amino silicone polyether copolymers, polyurethane dispersions with polyether segments, or ethoxylated alcohol blends. The examples of bio-based formulations available for moisture management in textiles are still quite limited, e.g., FERAN® BIO ICR (Rudolf Duraner), RUCO®-PUR BIO SLB (Rudolf Duraner), PMM (ProTecht), TANAFINISH™ Bio-Dry (TANATEX Chemicals), or Passerelle Quick-Dry NTL (Devan Chemicals).

According to the textile Coatings Market study by markets and markets,[3] the global textile coatings market was valued at around USD 4.4 billion in 20203 and is expected to increase to USD 5.4 billion by 2028, at a CAGR of 4.6%. Estimates suggest that the bio-based coatings market accounts for less that 5% of the global coatings market, however with a higher growth than the textile coatings marked, with a CAGR of 9.5%.[4] The increasing adoption of bio-based coatings in textiles is driven by several factors, including sustainability regulation, corporate sustainability goals, and consumer awareness.

The global sportswear market was valued at USD 335.92 billion in 2023, with a projection to grow at a CAGR of 9.9%, reaching approximately USD 646.01 billion.[5] In Europe alone, the sporting industry was 9.34 billion € in 2021, with the manufacture of wearing apparel accounting for 7.6% (0.7 billion €) of this. Some popular brands in the sportswear industry such as Patagonia, The North Face, Adidas and Activewear are integrating innovative biomaterials into their design. This not only reduces their ecological footprint but also sets a powerful example for the sportswear industry.

The spray coating technology for textile functionalization has been assessed as effective both in terms of functionality and in terms of costing. Functionalization through spray coating is easily scalable and can be applied to industrial production throughput reaching the quantities that can satisfy a daily industrial throughput of roughly 1 166 m^2 per month. With these quantities, also considering the depreciation of the pilot unit, the cost of spray coating per square meter is 0.43 €, corresponding to roughly 0.65 € for coating a t-shirt. Considering that the medium price of a high

[2] https://static1.squarespace.com/static/666b018c0edddc61de8d4e7c/t/67598bbe5210120051a6dd57/1733921727259/D7.9_M30_Task7.5.1_v1.pdf

[3] https://www.marketsandmarkets.com/Market-Reports/textile-coatings-market-188567907.html

[4] https://www.european-coatings.com/news/markets-companies/bio-based-coatings-growing-market-share-unclear-definition/?utm_source=chatgpt.com

[5] https://www.grandviewresearch.com/industry-analysis/sportswear-market

fashion t-shirt can range from 80 € up to 500 €, the finishing cost represents a negligible amount that can add an important value in terms of selling point and value proposition.

2.3.5. Commercialization channels and communication processes

For this new business segment, RIOPELE has a dynamic network of sales agents who will actively promote and sell the product. These agents are independent professionals or businesses who will use their local expertise and connections to help RIOPELE reach new customers in various markets.

The agents will work on a commission-based model, earning a percentage of each sale they make. They'll be equipped with all the tools, training, and support they need to effectively represent RIOPELE product line. Each agent will have a specific territory or customer segment to focus on, ensuring broad and efficient coverage.

By using a network of agents, RIOPELE can extend its reach to new regions, leverage local knowledge, and tap into established relationships that these agents have in their communities. This approach allows RIOPELE to be more flexible and agile, and to scale quickly without the overhead costs of a large internal sales team.

Communication Channels:

- Website and Digital Collection Platform Updates - New product featured on company's website and digital collection platform with high-quality images, specifications, and other relevant information.
- Social Media (LinkedIn, Instagram, etc.) - Promoting the new product to RIOPELE network and potential B2B clients through platforms like LinkedIn, Instagram, etc. showcasing product visuals and incorporating posts that explain the product's unique selling points and its relevance to the market.
- Trade Shows – Participating in relevant fairs to gain exposure for the new product and connect with potential buyers.
- Direct Mail and Samples - Introducing the product physically to potential buyers, sending explanatory brochures, and other relevant information.

2.3.6. Sales forecast

Figure 9 provides a comprehensive view of projected revenues for the period from 2027 to 2033, with a primary focus on Bio-based insolate sales in the B2B segment. The forecast is structured around expected service volumes, unit prices, and calculated total revenues.

		Grow prepective						
		50%	20%	10%	5%	2%		
Revenue Forecast / Services	Unit Price	expected services						
		2027	2028	2029	2030	2031	2032	2033
Bio-based insolate sales B2B	15 €	8,250	16,500	24,750	29,700	32,670	34,304	34,990
Bio-based insolate sales B2C via website	- €	0	0	0	0	0	0	0
Other Services	10 €	0	10	15	18	20	21	21
Technology licence & fees (sells)	- €	0	1	2	0	1	0	0
					TOTALS			

Total						
2027	2028	2029	2030	2031	2032	2033
123,750 €	247,500 €	371,250 €	445,500 €	490,050 €	514,553 €	524,844 €
- €	- €	- €	- €	- €	- €	- €
- €	100 €	150 €	180 €	198 €	208 €	212 €
- €	- €	- €	- €	- €	- €	- €
123,750 €	247,600 €	371,400 €	445,680 €	490,248 €	514,760 €	525,056 €

Figure 9 Forecast projected revenues for four distinct services from 2027 to 2033, along with a "Growth Perspective", for the bio-based coated textiles of W2BC.

Bio-based Insolate Sales B2B: The B2B sales of bio-based insolate coated textiles are the core revenue driver. The unit price is set at 15 € per meter, and the number of expected services begins at 8 250 meters in 2027, growing significantly to 34 990 meters by 2033.

This growth is supported by an annual growth rate perspective starting at 50% in 2027, which gradually decreases to 2% by 2033, reflecting a strategy of aggressive initial expansion followed by market stabilization.

The corresponding total revenues from this segment are projected to rise consistently from 123 750 € in 2027 to 524 844 € in 2033, highlighting steady demand growth and market penetration.

Bio-based Insolate Sales B2C via Website: The forecast does not anticipate any revenue from B2C sales via the website, indicating a clear strategic focus on the B2B market.

Other Services: The section includes additional services with minimal engagement, reflecting limited expected activity. These services are projected to generate no direct revenue throughout the forecast period, despite a small number of expected services.

Technology License & Fees (Sells): A small and irregular number of technology licensing transactions are expected between 2028 and 2031, but these do not contribute directly to the revenue. The absence of monetization here may suggest either a strategic decision to offer licenses free of charge to boost adoption or a lack of market interest.

2.3.7. Necessary investments to implement the activity

RIOPELE considers that it is not necessary to make initial investments, in addition to those already covered by the development of the **W2BC** project.

2.3.8. Costing assessment

Figure 6 breaks down the forecasted operational costs for the flexible films, taking the year of 2024 as basis. It outlines various cost categories, the percentage each category contributes to the overall solution cost, and the corresponding monetary value.

Operation costs	Value
Eletricity + water + gases + etc.	84,415.65 €
Raw materials	46,279.40 €
Marketing & Comunication	2,000.00 €
Travel costs	2,000.00 €
TOTAL FSE 2024	**134,695.06 €**

	Average salary	ETI	
Human Resources for the project (average salary)	**3,000.00 €**	**6.00**	**18,000.00 €**

TOTAL OPERATIONAL COSTS + HUMAN RESOURCES (YEAR) FORECAST	**152,695.06 €**

Figure 10 Forecasted operational costs for the bio-based coated textiles.

Operation Costs:

- Electricity, water, gases, etc.: The most significant operational cost which represents near 62% of total operational costs - 84 415.65 €.
- Raw materials: A forecast based in the average of materials necessary to produce the bio-based solutions, and the 2nd most significant operational cost – 46 279.40 €.
- Marketing & communication: The value of 2 000 € in this rubric was considered as this is a crucial area for business development, especially for promoting the solution within our stakeholders.
- Travel costs: This is a crucial area for business development accounts to be present in fairs and visit clients to promote the products – 2 000 €.

The sum of all listed operation costs amounts to 134 695.06 €, representing the total forecasted operational expenses (taking 2024 as basis), excluding human resources. Adding the human resources forecast, we'll have, with an average monthly salary of 3 000 € per person allocated to

this product and a suggestion 6 full-time employees dedicated to the project, resulting in a total human resource cost of 18 000 € for the year.

The total forecasted cost for the solution (taking in basis the calculation for 2024) to 152 695.06 €.

2.3.9. Potential revenue streams

Figure 11 presents a financial feasibility study spanning ten years, from 2024 to 2033, with a reference period of 10 years (likely indicating a base year for calculations, although its direct use isn't immediately obvious in the displayed data). The study uses an annual interest rate of 4.00% for discounting future cash flows.

This feasibility study suggests that the exploration project is projected to become financially viable starting in the 2nd year (2028). While there are initial operating costs, the anticipated revenue growth significantly outweighs these expenses in the later years. The positive and increasing "Cash Flows Accumulated and Updated" indicate that, considering the time value of money at a 4.00% discount rate, the project is expected to generate a substantial net positive return over the ten-year period. The final accumulated and updated cash flow of 1 854 203 € in 2033 suggests a very attractive investment opportunity, assuming the revenue and cost forecasts are accurate.

Reference period	10	
Interest Rate	4.00%	year

year		Investments	Forecast of Exploration Operating Costs	Revenue Forecast	TA	Updated Exploration Costs	Updated Exploration Revenues	Cash Flows	Cash Flows Accumulated and Updated
2024	0		- €	- €	1.00	- €	- €	- €	- €
2025	1		- €	- €	0.96	- €	- €	- €	- €
2026	2		- €	- €	0.92	- €	- €	- €	- €
2027	3		152,695 €	123,750 €	0.89	**152,695 €**	**123,750 €**	- 28,945 €	**- 28,945 €**
2028	4		152,695 €	247,600 €	0.85	**130,524 €**	**247,600 €**	117,076 €	**88,131 €**
2029	5		152,695 €	371,400 €	0.82	**125,504 €**	**371,400 €**	245,896 €	**334,026 €**
2030	6		152,695 €	445,680 €	0.79	**120,677 €**	**445,680 €**	325,003 €	**659,029 €**
2031	7		152,695 €	490,248 €	0.76	**116,036 €**	**490,248 €**	374,212 €	**1,033,242 €**
2032	8		152,695 €	514,760 €	0.73	**111,573 €**	**514,760 €**	403,188 €	**1,436,429 €**
2033	9		152,695 €	525,056 €	0.70	**107,282 €**	**525,056 €**	417,774 €	**1,854,203 €**

Figure 11 Financial feasibility study spanning ten years, from 2024 to 2033, for the bio-based coated textiles.

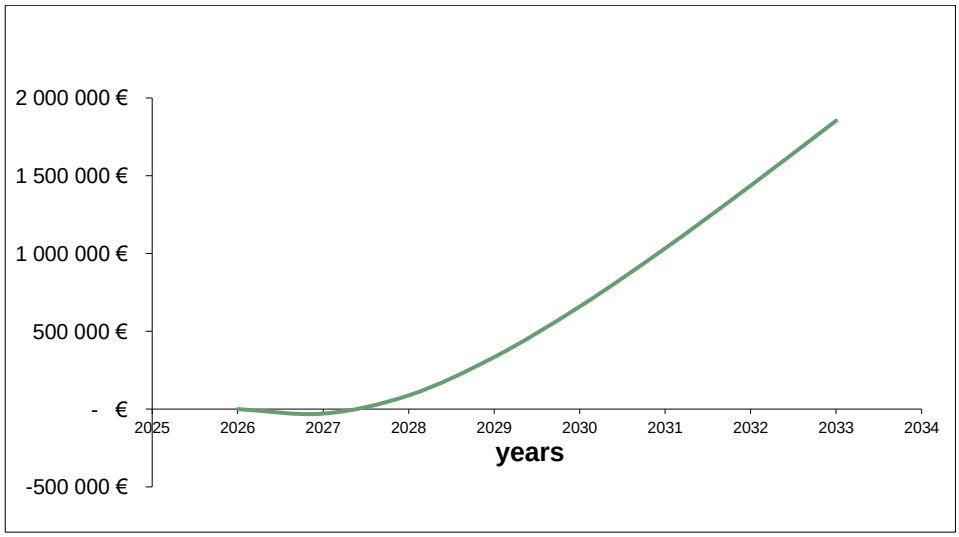

Figure 12 Cash flows spanning ten years, from 2024 to 2033, for the bio-based coated textiles.

2.3.10. Final SWOT Analysis

Positive	Internal		Negative
	Strengths	**Weaknesses**	
	+ Lower dependence on petroleum-based products + Sustainability, legislations & policies related to bioeconomy and green products in the textile sector + Use of products with high added-value and advanced technology + Partnership will ensure increasing know-how for companies R&D entities + Spray technology with lower cost for functionalization than other techniques more commonly employed	- Development of a dispersion with the required properties for spray application was difficult to achieve and created some technical issues – high demands of surfactants and dispersants - Up-scaling PHAs-based coating formulations has faced some challenges mainly due to difficult polymer dispersion in aqueous media - Raw material availability	
	Opportunities	**Threats**	
	+ Increasing global concern on manufacturing industries environmental impact + Increased demand for safe & sustainable products + Improved comfort and safety on textile products + Partnership between industries & R&D entities from complementary areas and different countries allows networking enlargement + New product synergies and market opportunities + Improvement of bio-based materials performance + Emerging market and end-user companies + EU guidelines concerning sustainable industry	- New patents that block the spray coating with PHAs - Project solutions do not present required performance nor intended impact on the demonstrators and end-users - Final cost of the developed products too high - Not enough policies and measures to support bio-based materials - Targeted markets resistance to new solutions	
	External		

3. Conclusions

Business models and business plans were developed for each VC (footwear, packaging and textile). Market surveys concluded that the products developed have a potential to reach high impact in their respective markets. This feasibility study suggests that the exploration project is projected to become financially viable starting in 2028 for the textile VC, 2029 for the packaging VC and 2030 for the footwear VC.

The SWOT analysis indicates some weaknesses that should be tackle in the next years, to overcome or at least decrease any impediment to the exploitation of these products. For all products, the provision of the raw materials (PHA) is crucial.

As a post-project activity, it will be analysed the possible "embedment" of such plans within the business/exploitation plans of each of the organizations (NORA, PROPAGROUP, RIOPELE). Given that the **W2BC** project is a Research and Innovation Action (RIA), the exploitation plans identify a proper technology assessment and upscaling roadmap to identify key development activities that might be needed to implement to increase the TRL of the obtained results.

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