D.1.3 Results of the application of the innovation metrology index to target industries of the plastic value chain

WP1: Innovation Opportunities for Circular Economy

Strengthening University tech transfer capabilities to support circular economy value chains for plastics in Latin America - **TechTraPlastiCE**

November 5, 2025

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Executive Summary

This document presents the deliverable 1/3 of the Work Package 1 (WP1) of the TechTraplatiCE project called Results of the Application of the Innovation Metrology Index to Targeted Industries of the Plastic Value Chain in Chile, Colombia, and Argentina. In the framework of a master's thesis in Industrial Engineering at the University of Santiago, a model was developed to evaluate the sustainable innovation capabilities of companies in the plastics sector, where 27 practices were identified and grouped into four pillars: Organization, Innovation Process, Team, and External factor. The model applied the Analytic Hierarchy Process (AHP) to determine the relative importance of practices within a hierarchical structure and uses five-level maturity grids to evaluate performance and guide improvement actions. The main objective of this deliverable was to identify the capacity of each company to innovate, diagnose their innovation maturity, identify critical weaknesses, and define targeted strategies to strengthen sustainable innovation capabilities.

The findings in sustainable innovation maturity across companies in Colombia, Argentina, and Chile reveals strong differences driven by company size and structural capabilities. In Colombia, large firms show the highest maturity, with solid Innovation Processes and Intellectual Property management, though weaknesses persist in Financial Management. Medium and small companies display fragmented structures and limited consistency, reflecting early-stage innovation maturity. In Argentina, most companies reach medium maturity levels. Large firms stand out in Team and Innovation Process factors, while microenterprises reveal both excellence in Eco-innovation and Creativity and weaknesses in Financial Management and Knowledge Capitalization. Lastly, in Chile, large companies achieve the most advanced maturity, particularly in Eco-innovation and Technological Strategy, while smaller companies

remain heterogeneous and financially constrained, with innovation concentrated in a few specialized actors. Overall, the findings show that large firms anchor innovation, while MSMEs face financial and organizational barriers. Strengthening financial mechanisms, collaboration networks, and technological capabilities is essential to reduce maturity gaps and foster sustainable innovation across the region.

1 Introduction

The TechTraPlastiCE project aims to strengthen the applied research and technology transfer capabilities of Higher Education Institutions (HEIs) in Latin America, enhancing their ability to support industry and contribute to the green and circular transition of the plastics sector. Within this framework, Work Package 1 (WP1) focuses on identifying and understanding the scope of HEIs' engagement with the Latin American plastics ecosystem, as a foundation for reinforcing their role as innovation enablers. *This constitutes one of the key innovative approaches implemented by the consortium across the participating universities in Colombia, Chile, and Argentina*.

A central methodological principle of this stage is to consider innovation processes as boundary objects (Ballard et al., 2021), conceptual tools that bridge the gap between academic knowledge and industrial practice. This approach enables HEIs to align their capacity-building competencies with the needs and dynamics of the industrial ecosystem. To operationalize this perspective, WP1 applies the Innovation Potential Index, a methodological instrument jointly developed by the Université de Lorraine and the Universidad de Santiago de Chile (Ureta et al., 2025).

Accordingly, this deliverable, *D1.3 – Results of the Application of the Innovation Metrology Index to Targeted Industries of the Plastic Value Chain*, informs the results of assessing the innovation capacity of companies within the plastics sector in Chile, Colombia, and Argentina, with the goal of identifying their potential to develop sustainable and circular innovations. In the scientific and policy literature, innovation dynamics are widely recognized as a critical competence for advancing the circular economy transition (Cillo et al., 2019; Hermundsdottir and Aspelund, 2021), as they enable organizations to identify and develop solutions that enhance both sustainability and competitiveness. Sustainable innovation includes the devel-

opment of products, processes, services, and technologies that generate positive economic, environmental, and social outcomes in both the short and long term (Tuckerman et al., 2023). It responds not only to the sector's immediate challenges but also integrates sustainability dimensions across all levels of operation, fostering resilient, equitable, and competitive growth. In this sense, innovation becomes a strategic capability that allows organizations to improve continuously while reinforcing their commitment to social and environmental responsibility.

The outputs of this deliverable are closely linked to the activities of *Work Package 2 (WP2) – Development of a Networked Portfolio*. The insights obtained from applying the innovation metrology index will inform HEIs about the specific needs, gaps, and innovation profiles of companies in the plastics sector. This knowledge will enable universities to refine their missions in terms of research, innovation, lifelong learning, technical assistance, and service provision, which is in direct alignment with industrial and societal needs for a circular economy.

Finally, the findings from WP1 will play a crucial role in guiding the design and implementation of WP2, facilitating the identification of synergies between industrial demands and HEIs' core competencies. On this basis, the following milestones will be to inquiry on the collective innovation portfolio for the plastics value chain to be co-created, leveraging universities' expertise and knowledge assets to accelerate sustainable transformation in Latin America.

2 Methodology

This section describes the methodological approach adopted to assess a management indicator of the capability of organizations for the development of sustainable innovations within the plastics value chain in Argentina, Chile, and Colombia. Aligned with the objectives of WP1 of Universities in identifying and understanding key barriers and leverage points of the local plastic companies to encourage collaboration opportunities with industries, the methodology seeks to generate a quantitative and comparable diagnostic that enables HEIs to better understand industrial needs, strengthen their technology transfer services, and guide future collaboration in the transition toward a circular plastic economy. To evaluate the internal capabilities of companies for developing sustainable innovation projects, a three-stage methodological approach was applied (see Figure 2.1).

The **stage I** seeks to define a conceptual framework to assess companies' sustainable innovation capabilities. This framework was built based on existing models and methodologies found in the scientific literature (Cillo et al., 2019; Ghobakhloo et al., 2021; Harsono et al., 2024; Hermundsdottir and Aspelund, 2021; Tuckerman et al., 2023; Ureta et al., 2025) which were analyzed and adapted to the specific evaluation context of the TechTraPlastiCE project. The resulting reference model integrates four major factors (External, Team, Innovation process and Organizational) and 27 specific practices, ensuring its relevance to the plastics value chain in Latin America. This is explaining in detail in the following subsection.

The **stage II** focused on defining the application strategy for the evaluation model developed in Stage I. This step required specifying three key elements:

1. Scope of the evaluation: to conduct a quantitative diagnostic assessment of companies in the plastics industry across Argentina, Chile, and Colombia.

2. Target industries: to include firms representing different segments of the plastics value chain (production, transformation, recycling, and services).
3. Individualized diagnosis for companies: develop a personalized diagnosis to share witht he participants identifying their sustainable innovation potential.

To ensure effective implementation, an academia–industry collaboration strategy was established based on two key levers: 1) Leveraging existing collaborations between HEIs and industry partners already engaged in innovation and technology transfer activities. and 2) Engaging trade associations within the plastics sector, acting as intermediaries between universities and companies to facilitate participation and data collection. The involvement of the external socio-economic ecosystem—including industrial partners, associations, and other stakeholders—is essential for the success of TechTraPlastiCE.

Lastly, each participating company receives an individualized diagnostic report highlighting its strengths and weaknesses in sustainable innovation. These reports serve as a foundation for developing improvement and action plans that guide subsequent collaboration phases within the project.

Lastly, **stage III** involves a comprehensive analysis of the results obtained. At the national level, a descriptive statistical analysis identifies general trends and sectoral characteristics in each country. Subsequently, a cluster analysis groups companies according to their profiles in sustainable innovation capability. This enables the identification of distinct patterns, maturity levels, and best practices that influence innovation performance within the plastics value chain.

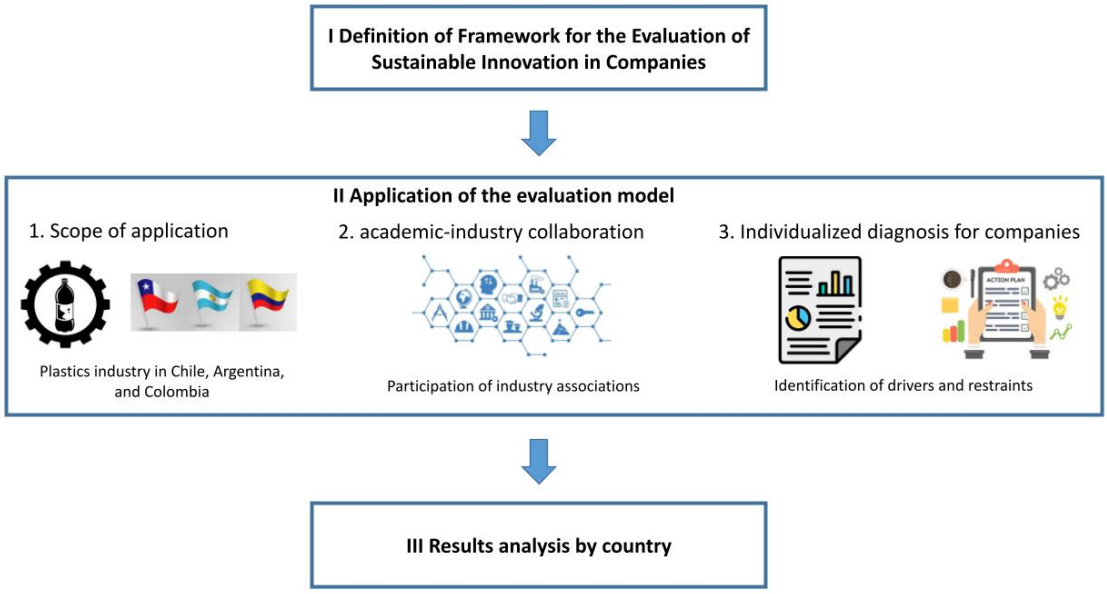

Figure 2.1: Three-stage methodology.

2.1 I. Definition of framework

In the framework of a master's thesis in engineering sciences, specializing in industrial engineering at the University of Santiago de Chile, a conceptual model was developed to evaluate the sustainable innovation capabilities of companies in the plastics sector.

Following an exhaustive literature review of existing models for assessing corporate innovation capabilities (Bhatti et al., 2023; García-Pozo et al., 2016; Ortega-Lapiedra et al., 2019; Scarpellini et al., 2019), and a comparative analysis of their respective features, a model was designed with the following key characteristics:

1. Based on best practices identified in the literature and industrial experience.
2. Structured as a multi-criteria framework to capture different dimensions of sustainable innovation.
3. Applying a maturity grid evaluation method to assess the level of capability development within each company.

This approach draws not only on theoretical insights from previous studies but also on the practical experience of the *Université de Lorraine and the Universidad de Santiago de Chile* in developing management indicators for SMEs (Galvez et al., 2013; Muñoz et al., 2022).

The identification of good practices (Galvez et al., 2018) serves as the foundation for understanding the internal functioning of companies, allowing the recognition of key activities and routines that support the implementation of sustainable innovation projects. From the literature review, an initial list of potential practices was compiled and subsequently refined through iteration, ensuring relevance to the specific context of the plastics industry in Latin America.

As a result, 27 good practices were identified and grouped into four main pillars representing the core dimensions of sustainable innovation capability within the plastics sector as illustrated in Figure 2.2.

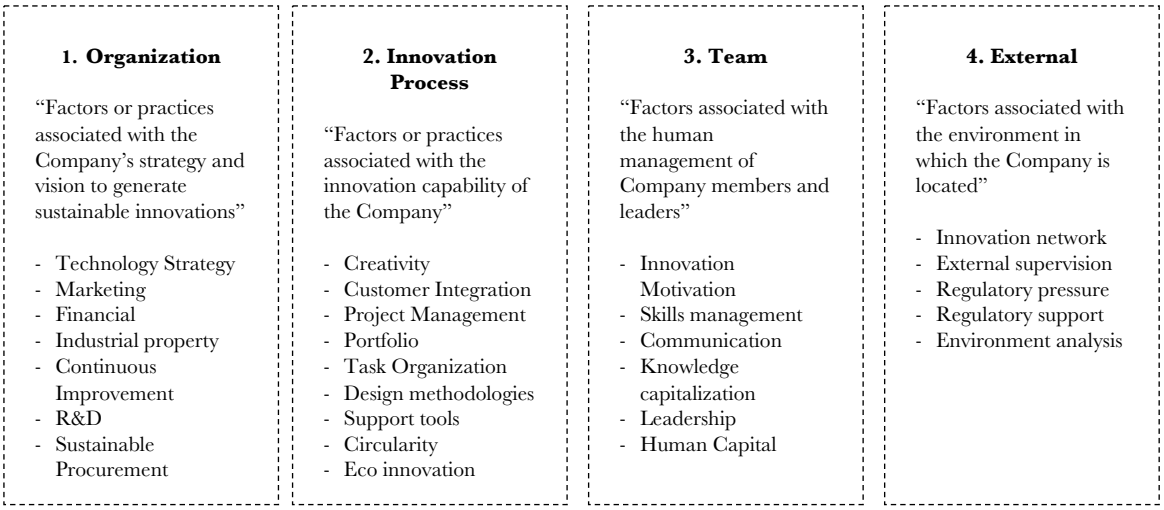

Figure 2.2: Main pillars of the sustainable innovation capability.

The first pillar represents practices associated with the organization of the company, considering aspects such as strategy, financing, intellectual property, among others (Bhatti et al., 2023). The second pillar focuses on practices that support the innovation process from divergence (idea creation) to convergence (design and prototyping) (Monteiro et al., 2024; Severo et al., 2017). The third pillar refers to the work team, analyzing competencies, leadership, and communication in the company's operations (Ortega-Lapiedra et al., 2019). Finally, the fourth pillar evaluates how the company relates to the outside world in terms of competition analysis,

customers, regulatory aspects, among others (Li et al., 2021). The definition of each factor is presented in the following Table 2.1.

Table 2.1: Definition of the good practices in the implementation of sustainable innovation projects.

Group	Acro.	Factors	Definition
External Factors	A.E	Analysis of the Environment	This corresponds to the strategic assessment of external factors (economic, social, technological, and regulatory) that influence sustainable innovation. It considers not only regulation, but also the market, consumer trends, competition, and changes in demand.
	I.N	Innovation Networks	This refers to strategic collaborations between companies, universities, research centers, and government agencies. They facilitate the exchange of knowledge, technologies, and best practices that promote sustainable innovation. This component focuses on interaction and cooperation within the innovation ecosystem.
	E.S	External Supervision	This refers to the set of control, audit, and regulatory mechanisms applied by government agencies, industry associations, and the market. Its purpose is to ensure that companies comply with environmental regulations and sustainability standards.
	R.P	Regulatory Pressure	This corresponds to regulations and legal requirements that oblige companies to adopt more sustainable practices. It can manifest itself in environmental restrictions, energy efficiency requirements, or emission reduction targets. It represents the mandatory side of regulation, i.e., the rules that companies must follow in order to operate within the law.
	R.S	Regulatory Support	This refers to government policies and programs designed to promote sustainable innovation, such as financing, advice, and eco-certifications. It is the counterpart to regulatory pressure, as it represents an incentive rather than an obligation.
	I.E.C	Internal and External Communication	It corresponds to the process by which the company facilitates the exchange of information among work teams, fostering collaboration and the integration of knowledge in initiatives based on sustainable innovation.

(continued)

Group	Acro.	Factors	Definition
Team factors	H.C	Human Capital	It is defined as the set of knowledge, skills, experience and capabilities acquired by employees, which directly influence the company's ability to develop innovations that encompass the triple bottom line.
	M.I	Motivation for Innovation	This refers to the level of commitment, enthusiasm, and willingness of employees to get involved in developing innovative solutions. It is not just about having technical knowledge, but about wanting to actively apply it to the sustainable transformation of the company.
	S.M	Skills Management	This refers to the set of strategies and processes that the company implements to develop, update, and manage the team's skills, ensuring that they are aligned with the needs of innovation.
	C.K	Capitalization of Knowledge	This refers to the process of documenting, storing, and reusing the knowledge generated within the company, ensuring that best practices and lessons learned in innovation are accessible and applicable in the future.
	LEA	Leadership	Refers to the ability of executives and managers to promote sustainability, guide teams toward strategic innovation goals, and efficiently manage human capital.
	I.P	Innovation Portfolio	This refers to the strategic management of innovation projects, ensuring their alignment with the company's vision. Managing the project portfolio allows you to control the pace of new releases, avoid resource congestion, and not focus exclusively on the short term at the expense of the long term.
	E.P.P	Eco-innovation in products and processes	This refers to the implementation of technological and organizational innovations that improve a company's environmental performance, optimizing the use of natural resources and reducing the environmental impacts of industrial production.
	S.T	Support Tools	This refers to the use of technologies and systems that facilitate the implementation of sustainable innovations, such as simulation software, modeling, and data analysis tools to assess the viability of new processes.

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Group	Acro.	Factors	Definition
Innovation Process	D.M	Design Methodologies	Refers to design strategies used to develop sustainable products and processes, including eco-design, life cycle assessment (LCA), and waste minimization strategies.
	T.A	Task Organization	This refers to the efficient structuring of activities within innovation processes, ensuring the optimal allocation of resources, time, and responsibilities in sustainable development projects.
	I.P.M	Innovation Project Management	It refers to the management of resources, deadlines, risks, and objectives in the development of innovation projects, ensuring their effective execution and alignment with sustainability principles.
	CIRC	Circularity	This corresponds to strategies for recycling, reuse, and reduction in production processes, together with the use of metrics to evaluate the efficiency of these changes.
	C.I	Customer Integration	It refers to incorporating customer feedback and needs into the development of innovations, ensuring that products and processes meet market expectations and encourage the adoption of sustainable solutions.
	CREA	Creativity	This refers to the generation of innovative ideas that enable the transformation of products, processes, and business models into more sustainable, efficient solutions with a lower environmental impact.
	MARK	Marketing	It refers to communication and positioning strategies to differentiate sustainable products and generate value in the market.
	F.M	Financial Management	It corresponds to the administration of financial resources to fund sustainable innovation projects and responsible purchasing.
	I.P2	Intellectual Property	This refers to the protection of innovations and technologies that contribute to the sustainable competitiveness of the company.

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Group	Acro.	Factors	Definition
Organization	C.I3	Continuous Improvement	This involves the constant evaluation and optimization of processes to improve efficiency and reduce environmental impacts.
	R.D	Research and Development	Refers to the development of new technologies, products, and processes aimed at sustainable innovation.
	T.S	Technological Strategy	This involves integrating advanced technologies to optimize production and reduce environmental impacts within the organization.
	S.P.S.P	Sustainable Purchasing in the Supply Chain	Refers to procurement and logistics management strategies based on environmental, social, and economic criteria to reduce negative impacts in the supply chain and improve sustainable competitiveness.

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Once the practices were defined, the model was structured using the Analytic Hierarchy Process (AHP) multi-criteria method. This approach was selected for its hierarchical structure and its ability to calculate a weighting vector that determines the relative importance of the practices comprising the model. Figure 2.3 shows the final structure of the proposed model.

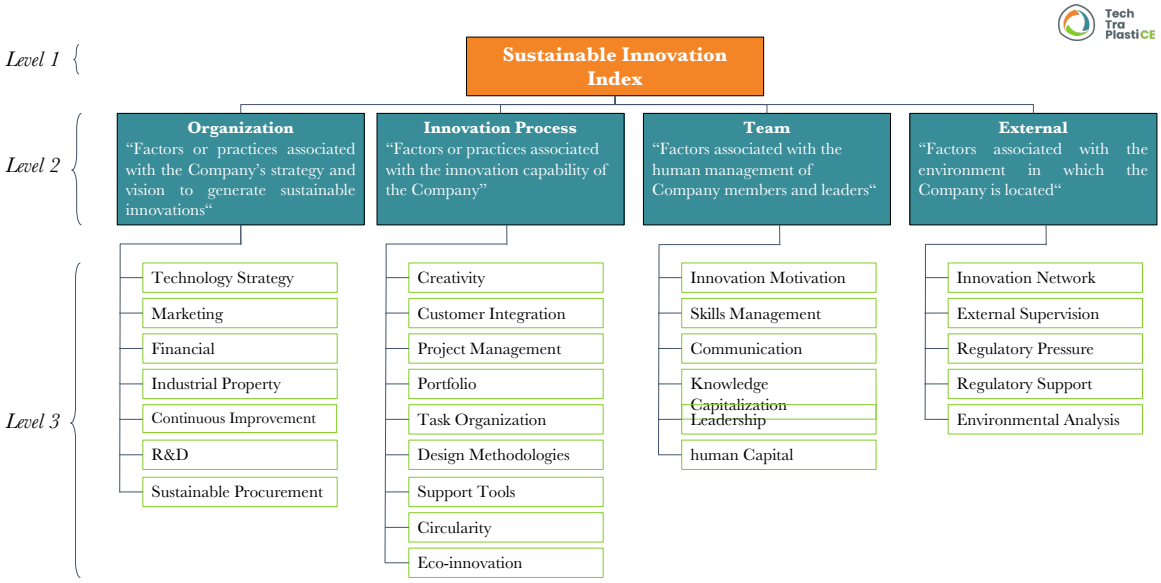

Figure 2.3: Final structure of the model.

The hierarchy structure of the model is divided into three levels. At the first level, the global sustainable innovation index is found, which represents the company's capability to implement this type of project. At the intermediate level are placed the four pillars described in the evaluation framework. At the lowest level are the practices that characterize each pillar. These practices represent activities and routines that the company can implement to improve its capacity for sustainable innovation. In other words, the company's overall capability is determined by its performance across these practices.

According to the functioning of the multi-criteria structure based on the AHP method, the evaluation is applied at the lowest level of the hierarchical structure, that is, to the practices. Each practice represents different activities undertaken by the company, allowing it to evaluate its performance. This performance depends on factors such expertise, human capital, methods and tools employed, among other resources. The evaluation approach adopted is the maturity grid, a widely used method for assessing the performance of internal organizational activities or practices through the definition of progressive levels of maturity.

Table 2.2: Maturity grid example for innovation networks –IN-.

Level 1	Level 2	Level 3	Level 4	Level 5
The company works only with internal resources	The company works with customers or suppliers.	The company typically uses external resources privileging two of the three impacts	The company regularly engages in collaborative projects that are selected according to its sustainable innovation strategy.	The company follows an openness strategy with leading actors in sustainability.

The definition of these grids is essential, as it allows the assessment to be adapted to the specific type of sustainable innovation. The grid reflects how companies implement practices and identify the resources and actions required to achieve triple-impact innovations. Each practice is evaluated using a five-level maturity grid as illustrated in Table 2.2. For example, the grid developed for the *innovation networks* (*I.N*) practice illustrates this approach. Each good practice is related to a precise level of maturity. For the complete questionnaire refer to the Annex Section A.

The main advantage of using maturity grids lies in their ability to reduce response subjectivity, since each level is defined according to observable phenomena. In addition, they facilitate the development of targeted improvement plans, as the five maturity levels for each practice are available. Therefore, if the company is positioned at an intermediate level for a given practice, it becomes evident which actions must be undertaken to reach the next level.

The development of this model for assessing the sustainable innovation capability of companies was presented by a master's student at the IAMOT (International Association for Management of Technology) 2025 international conference in Canada (Astudillo et al., 2025).

2.2 II. Application of evaluation Model

To implement the proposed assessment model in partner companies, a dedicated tool was developed. It consists of a survey comprising 27 questions structured according to the maturity grid approach, where one maturity grid question corresponds to each of the 27 practices defined in the model. The survey was made available online to facilitate participation and data collection from companies.

2.2.1 Scope of Application

Within the objective to evaluate partner companies across the three Latin American countries participating in the project and ensure comparability, a set of basic characteristics was defined to guide the selection of companies in each country. The assessment primarily targets companies within the plastics industry, with a goal of engaging at *least ten companies per country*. A socialization of the task was made on June 09/20025 at the general monthly meeting of the TechTraPlastiCE consortium as presented in Figure 3.1.

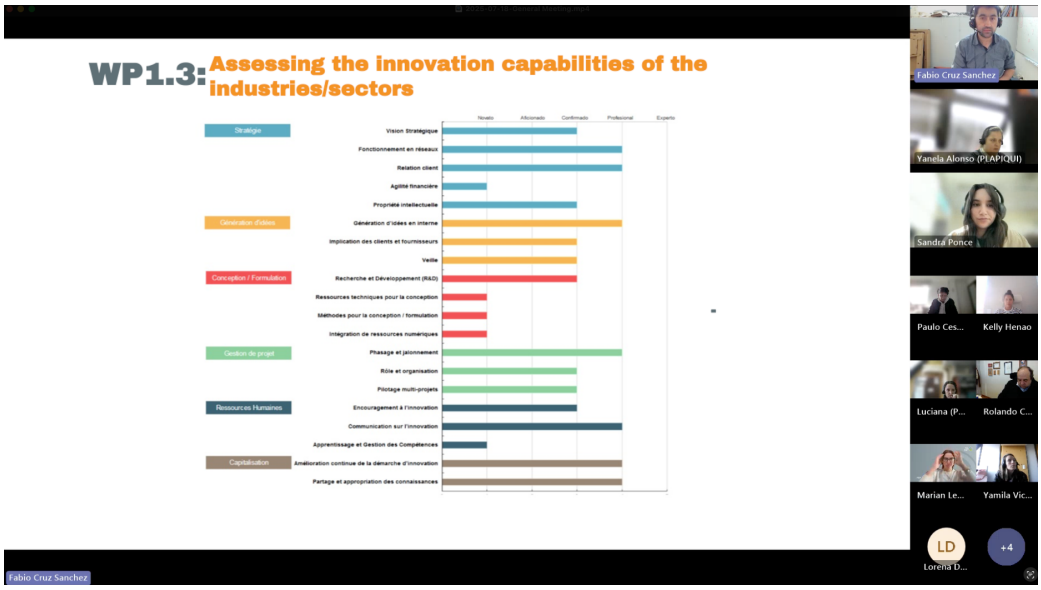

Figure 2.4: Socialization of the task on General Meeting June 09/2025.

2.2.2 Academia-industry collaboration strategy

The success of the survey implementation is directly linked to the strength of the relationship between academia and industry. To promote this collaboration, two strategies were adopted: (1) leveraging existing connections within the university environment and (2) engaging trade associations in the plastics industry. In the first strategy, the partner universities that already have experience in projects involving companies from this sector, helped to foster trust in their work and, consequently, increased the willingness of these companies to participate. The second strategy aims to expand the scope of action and engage a larger number of companies through intermediaries, specifically, trade associations within the plastics industry. For instance, in Colombia this involves the participation of **ACOPLASTICOS** (https://acoplasticos.org/), and in Chile with **ASIPLA** (https://asipla.cl/). These associations serve as facilitators by promoting participation in the survey among their member companies.

For both strategies, explanatory manuals are being developed to support understanding of the model and to facilitate the application of the survey. Additionally, a designated contact person is made available to address any questions or requests for clarification from participating companies.

2.2.3 Individualized diagnosis for companies

Once the questionnaire is completed and analysed, each company receives a diagnostic report assessing its sustainable innovation capabilities. This report presents the companies' overall index, along with detailed profiles organized by pillar and by practice, thereby identifying specific strengths and weaknesses. The diagnosis enables companies to better understand the activities that influence their potential to implement sustainable innovation projects.

Companies that have already developed sustainable innovation projects can use the report's findings to standardize their practices, thereby enhancing their capacity to replicate and scale similar projects. Furthermore, companies interested in developing an improvement plan are invited to contact the research team to schedule a follow-up meeting.

The entire process of conducting the survey and delivering diagnostic reports to companies was conducted by a *master's student from the University of Santiago, Chile, and a master's student from the National University of Colombia, with support from undergraduate students who provided methodological and technical assistance to the participating companies*.

The final stage of the methodology involves the analysis of the results, which is presented in the following section.

3 Results

This section presents the results of the survey, organized by country. First, a descriptive analysis of the responses is conducted for each country, categorized by company size. Subsequently, a cluster analysis is performed to identify company profiles based on the evaluated factors, allowing for the characterization of their capacity to implement sustainable innovations.

3.1 Descriptive Analysis of the Results

The distribution of participating companies by size is summarized in Table Table 3.1. For the purposes of this study, company size was categorized according to the number of employees, as follows:

- Micro enterprises: 1–9 employees
- Small enterprises: 10–49 employees
- Medium-sized enterprises: 50–199 employees
- Large enterprises: 200 or more employees

Between June 15, 2025, and October 15, 2025, a total of 68 enterprises from Argentina, Chile, and Colombia participated in the survey and completed the evaluation instrument. The analysis reveals that medium-sized and large companies represent the majority of participants across the three countries, accounting for approximately 58.8% of the total sample. In Colombia, these companies constitute around 63.9% of national participants and 33.8% of the overall sample. In Argentina, medium and large firms make up about 60% of national participants, corresponding to 17.6% of the total sample. Finally, in Chile, companies of similar size represent 41.7% of national participants and 7.4% of the total sample.

Table 3.1: Distribution of participating companies by size

Country	Size	# Enterprises	% per country
Argentina	Large	7	35.00
	Medium	5	25.00
	Small	3	15.00
	Micro	5	25.00
Chile	Large	2	16.67
	Medium	3	25.00
	Small	4	33.33
	Micro	3	25.00
Colombia	Large	11	30.56
	Medium	12	33.33
	Small	6	16.67
	Micro	7	19.44

Figure 3.1 illustrates the distribution of participating enterprises from Colombia, Chile, and Argentina according to company size. The sample indicates a particularly active participation from Colombian enterprises, which account for 52.9% of the total respondents.

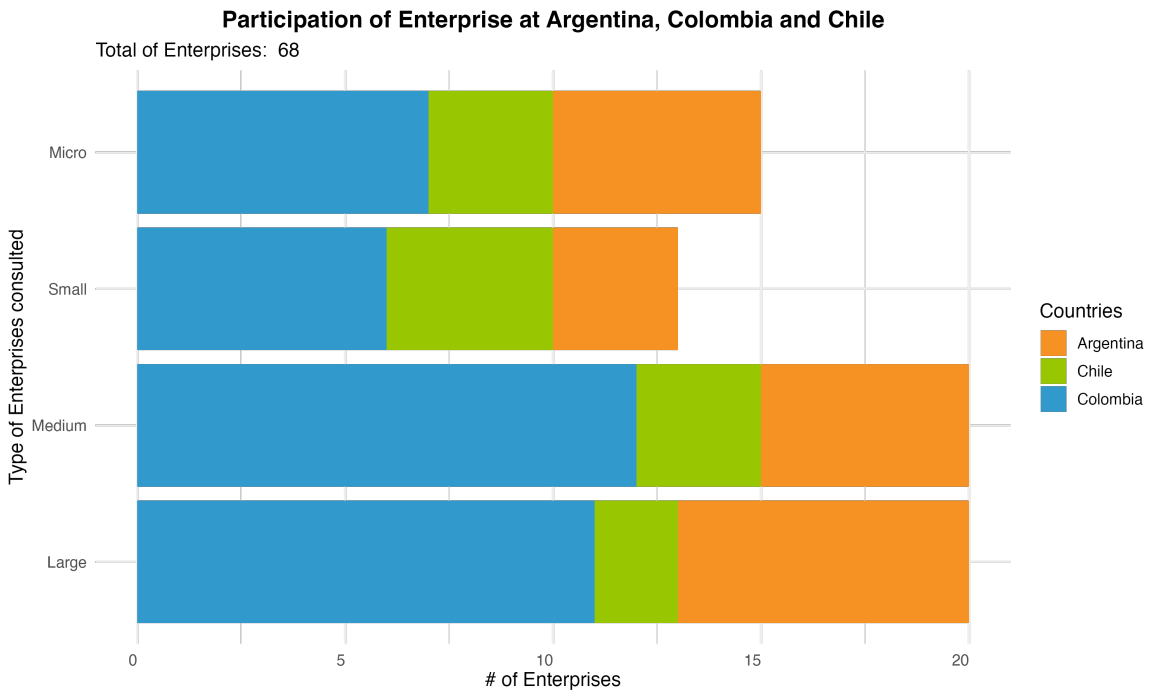

Figure 3.1: Distribution of enterprises by size

In the following section, an analysis by country is made to better understand the global results.

3.2 Analysis by Country

3.2.1 Colombia

Figure 3.2 presents the results of the average value of the evaluated practices discrimated by the size of the enterprises at Colombian enterprises.

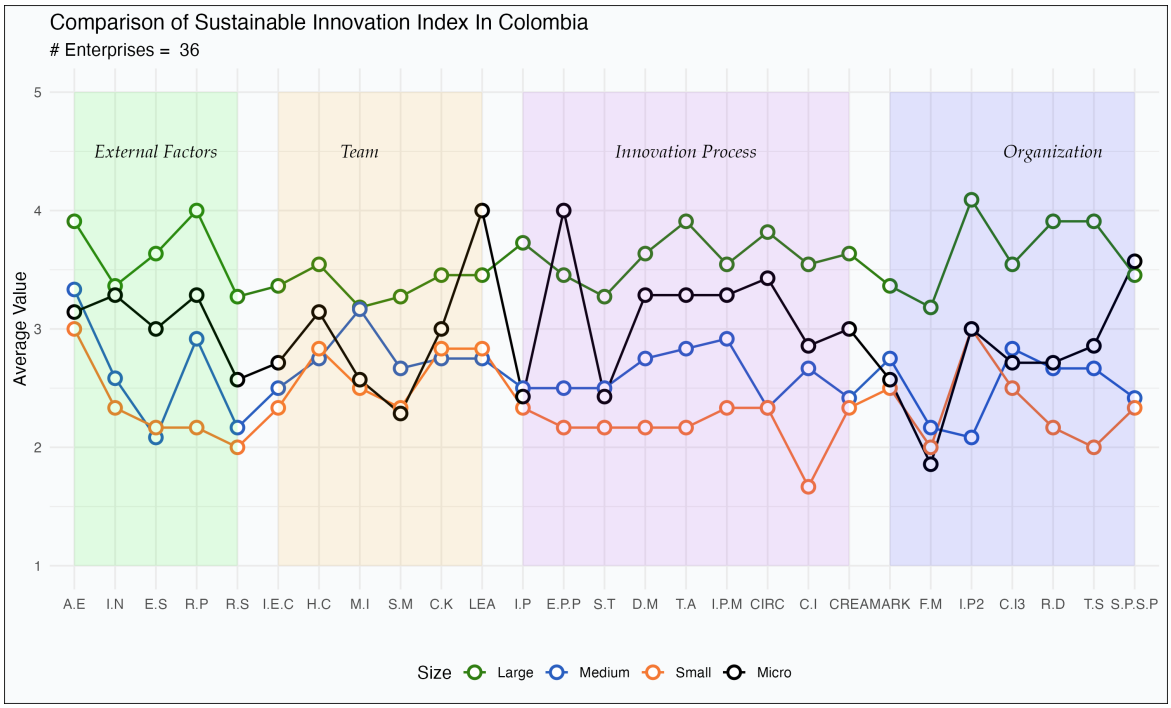

Figure 3.2: Global Sustainable Innovation index per practice at Colombia enterprise

In the Colombian context, analysis of the level of maturity in innovation and business management reveals a landscape where strengths and weaknesses vary significantly depending on the size of the company, reflecting the structural diversity and capabilities of the national productive fabric.

Large companies show the greatest strengths, with an average maturity level of around 3.6, particularly in *Intellectual Property* (4.5). Innovation Processes, Organizational management and Team factors, with values ranging from 3 to 4.5, demonstrating solid structures, clear technological strategies, and a consolidated culture of continuous improvement. However, their main weakness lies in financial management which averages 3.2. Although not critical, this represents an area of opportunity for improving the financial sustainability of innovation activities.

Medium-sized companies, with an average maturity level (~ 2.6), show partial strengths in some specific indicators, such as *Analysis of the Environment* (3.75) and *Motivation for Innovation* (3.3), as well as good results in certain components of the Innovation Process (*Design Methodologies, Support Tools, Innovation Project Management, and Eco-innovation in products and processes*) with values between 3.5 and 4. However, their main weakness lies in a general lack of consistency, as most indicators remain between 2 and 3, (specially

organizational factors) reflecting an incipient and heterogeneous maturity. In the case of small enterprises (~2.4) exhibit the lowest levels of maturity, with few strengths, such as *Analysis of the Environment*(3) and *Human Capital* (3), and multiple weaknesses in innovation and organization, *Customer Integration CI* (1.8), *Financial Management* (2.0), *Research and Development* (1.9), and *Technological Strategy* (1.8) reflect deficiencies in technological, financial, and knowledge management capabilities. This result is to be expected, as small companies normally only plan for the short term and spend their time solving day-to-day problems, which makes it difficult to manage sustainable innovation projects that require greater uncertainty management.

In the case of micro-enterprises (~2.9), there is greater variability in their assessments. They show some isolated strengths in External Factors, with values close to 3.5, and in some indicators such as *Eco-innovation in products and processes* (4.1), but they have significant weaknesses in *Financial Management* (2), *Regulatory Support* (2.6), and* Competence Management* (2.6), suggesting a fragile structure. Due to their size, these companies have a flexible structure, which favors agility in some processes but hinders resource support in other activities, which is why there is greater variability in their practices,

In summary, the analysis shows that Colombia faces a marked gap in business maturity, where large companies act as poles of development and innovative leadership, while micro, small, and some medium-sized companies still need to strengthen their organizational, financial, and technological capabilities to achieve sustainable and competitive performance at the national and international levels.

3.2.2 Argentina

As presented in the Figure 3.3, the analysis of the level of maturity in sustainable innovation management in the case of Argentina reveals a picture of strengths and weaknesses that vary according to company size, with a general trend toward medium levels of development in the practices evaluated.

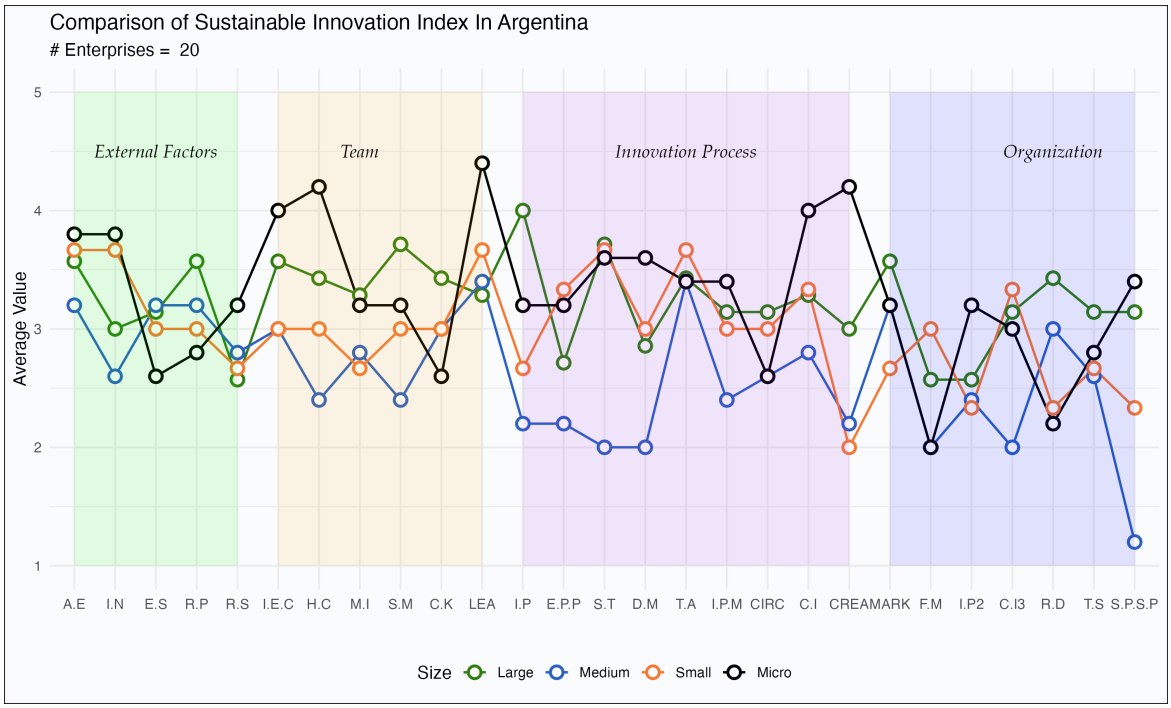

Figure 3.3: Global Sustainable Innovation index per practice at Argentina

The analysis of Argentinian companies reveals distinct patterns in sustainable innovation maturity across different firm sizes, as summarized below.

Large enterprises (7 in total) demonstrate an intermediate to high level of maturity (between 3.0 and 4.0). They perform particularly well in the *Team* and *Innovation Process* practices, where results are both solid and consistent. However, they show specific weaknesses in *External Supervision* (2.7), *Financial Management*, and *Intellectual Property*, all with average scores below 3.0. These findings indicate that large companies possess robust organizational structures but still have room for improvement in external monitoring and resource management.

On the other hand, medium-sized companies (5 in total) display a medium-to-low maturity level (~ 2.8), with homogeneous evaluations and no major contrasts between factors. Their main strengths are found in *Leadership* (3.4) and *Task Organization* (3.6), whereas significant weaknesses appear in Organizational Management, particularly *Sustainable Purchasing within the Supply Chain* (1.4). Overall, these companies exhibit a lack of comprehensive coordination across their innovation processes.

Regarding the small enterprises (3 in total) present low to medium maturity levels (~ 2.8), with strengths in *Analysis of the Environment and Innovation Networks (above 3.7)* and* leadership

(LEA 3.6), but with heterogeneous Innovation Processes where weaknesses are evident in Creativity *(2.0) and* Innovation Portfolio* (2.7), and *limited organizational management*, with exceptions such as *Continuous Improvement* (3.3).

Micro-enterprises (5 in total) exhibit a more dispersed maturity profile. They perform well in external factors, including Environmental Analysis and Innovation Networks (both near 4.0), and in team-related dimensions such as Internal and External Communication, Human Capital, and Leadership, all scoring above 4.0. Additionally, they show promising results in Creativity (4.2) and Continuous Improvement (4.0). However, these strengths are counterbalanced by structural weaknesses in Financial Management (2.0), R&D (2.2), and Knowledge Capitalization (2.6), which hinder the consolidation of their innovation capabilities.

Overall, the variation in performance among Argentinian companies is not strongly correlated with firm size. This uniformity may be influenced by the regional industrial ecosystem, where local institutional support and development programs contribute to a more level playing field among companies.

In general terms, practices associated with operational management tend to achieve higher evaluations than those linked to strategic planning, which explains the lower average scores in the Organizational Pillar.

3.2.3 Chile

In the case of Chile in Figure 3.4, analysis of the level of maturity in innovation and business management shows notable differences between companies of different sizes, although the results should be interpreted with caution due to the limited sample size.

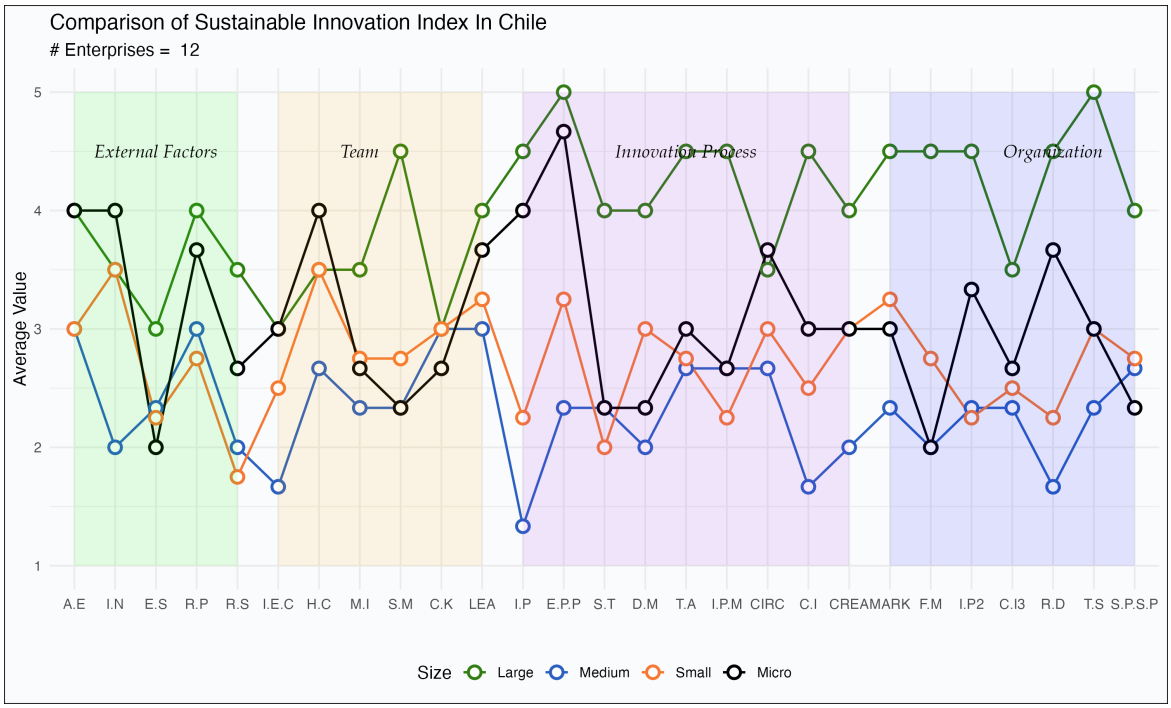

Figure 3.4: Global Sustainable Innovation index per practice at Chile

Large companies (two in total) have the highest levels of maturity, with scores between 4 and 5 in most pillars, standing out in Innovation Process (with *Eco-innovation in products and processes* at 5 and *Technological Strategy*, *Task Organization*, *Innovation Project Management*, and *Customer Integration* at 4.5) and in Organization, where the *Marketing, Financial Management, Intellectual Property*, and *Research and Development* factors reach averages of 4.5 and *Technological Strategy* reaches 5. They also excel in Team, with high values in *Skills Management* (4.5) and *Leadership* (4.0), and consistent performance in external factors, with averages between 3 and 4, indicating an advanced level of internal structuring and management.

In contrast, medium, small, and micro companies show intermediate or low levels of maturity, with overall averages between 2 and 3, evidencing processes in consolidation and heterogeneity in results. Medium-sized companies generally have the lowest assessment profile, showing weaknesses in the innovation process (*Innovation Portfolio* 1.3, *Eco-innovation in products and processes* 2.3) and organizational management (*Research and Development* 1.7, *Financial Management* 2.0). Small companies obtain averages close to 2.5, with better results in Innovation *Networks* (3.5) and *Leadership* (3.5), but with low values in *Regulatory Support* (1.6) and basic innovation processes (*Innovation Portfolio, Support Tools, Innovation*

Project Management ~2). Finally, micro-enterprises combine strengths in *Eco-innovation in Products and Processes* (4.7), *Environment Analysis and Innovation Networks* (4.0), and *Human Capital* (4.0) with weaknesses in *External Supervision* (2.0) and *Financial Management* (2.0), suggesting partial and uneven maturity.

The Chilean context shows a heterogeneous business profile, where leadership, planning, and technological process capabilities are concentrated in a small group of companies, while the rest of the business fabric maintains less mature structures with potential for strengthening.

These results, although based on a limited sample, indicate the need to continue promoting the systematization of innovative practices, knowledge management, and inter-company coordination as key areas for advancing toward greater levels of maturity and competitiveness in the Chilean business environment.

3.3 Analysis of the Sustainable Innovation Index by Size of the Enterprise

3.3.1 Large companies at Colombia, Argentine,Chile

This section presents the comparative Analysis of the Innovation Index for large enterprises across Colombia, Argentine, and Chile.
Figure 3.5 shows the assessment of factors for large size companies in the Colombian, Argentinian and Chilean context. In total, 20 enterprises were considered in the set of answers. From the results is observed that large Chilean companies stand out as the best rated in indicators associated with innovation processes and organizational management, with average values in the range of 4-5. However, it should be noted that the number of companies evaluated in Chile was lower compared to those in Colombia and Argentina.

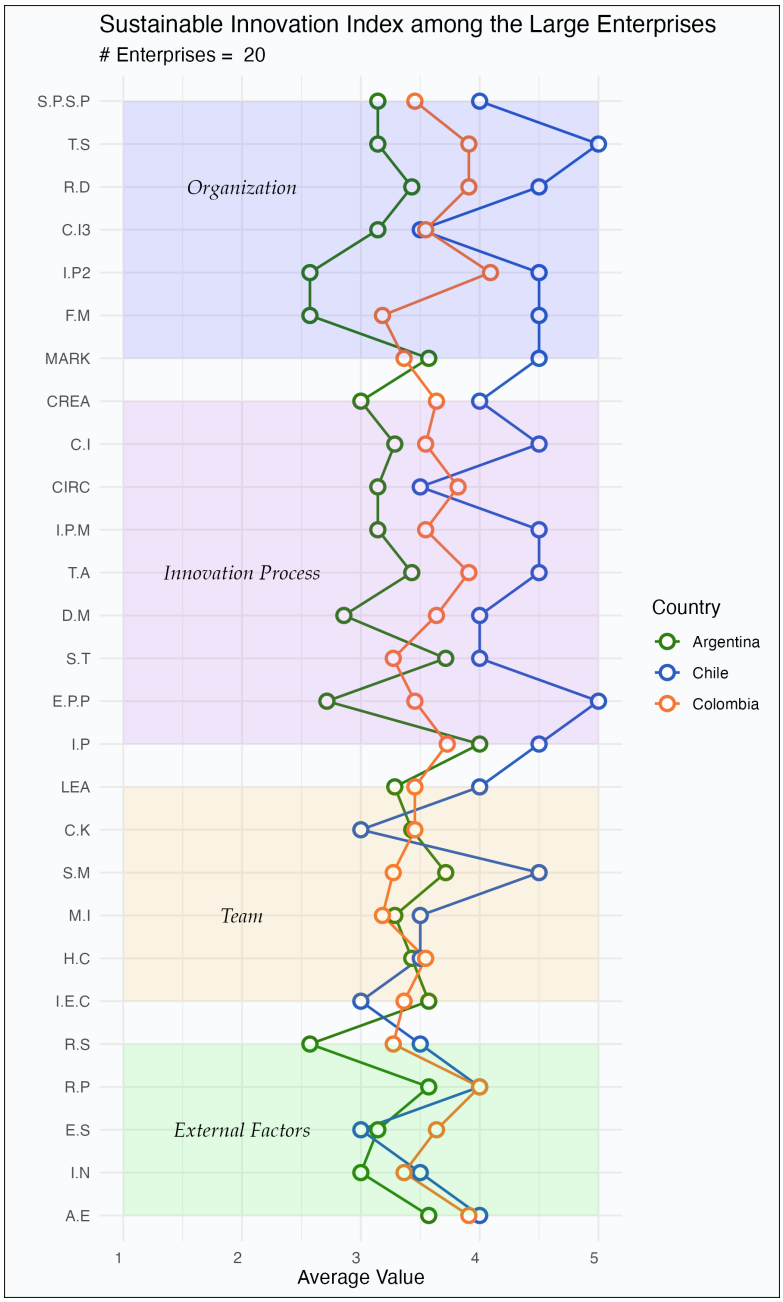

Figure 3.5: Comparison of the practices for Large companies Argentina, Colombia and Chile

Large Colombian companies, on the other hand, show intermediate levels of maturity in these factors (averages in the range of 3.4), while large Argentine companies receive the lowest ratings, with average values between 2.5 to 3.5. These results show that large Chilean companies have internalized and consolidated innovation processes and tools within the organization, which is supported internally by clear organizational management in areas

relevant to innovation processes, such as *research and development, intellectual property management, financial management*, and *marketing*.

In the case of Colombia, the results of large Colombian companies show *innovation* and *organizational management processes and practices* in the process of maturing to carry out sustainable innovations, with balanced levels of maturity in their practices. Finally, the values reported by large Argentine companies show medium-low levels of maturity in terms of innovation and organizational processes, which must be strengthened for the development of sustainable innovations.

Regarding practices associated with team management and external factors, Figure 3.5 shows similar behavior in large companies in the three countries, except for the factors such as, *Skill Management (S.M)* and *Regulatory Support (R.S)*. In the case of S.M, large Chilean companies report high maturity values (average 4.5), while large Colombian and Argentine companies report intermediate maturity values close to 3.5. Therefore, large Chilean companies would have skill management strategies more aligned with innovation and sustainability than large Colombian and Argentine companies. However, large Colombian and Argentine companies show a high level of maturity in this practice.

Finally, in relation to regulatory support, large Argentine companies report having low regulatory support compared to Chilean and Colombian companies. In other words, they report having few government policies and programs to support the development of sustainable innovations. Despite this, large companies are trying to take advantage of opportunities for *innovation* (A.E high) and *collaboration* (I.N medium-high).

3.3.2 Medium companies at Colombia, Argentine,Chile

Figure 3.6 shows the assessment of factors for medium size companies in the Colombian, Argentinian and Chilean context. In total, 20 enterprises were considered in the set of answers.

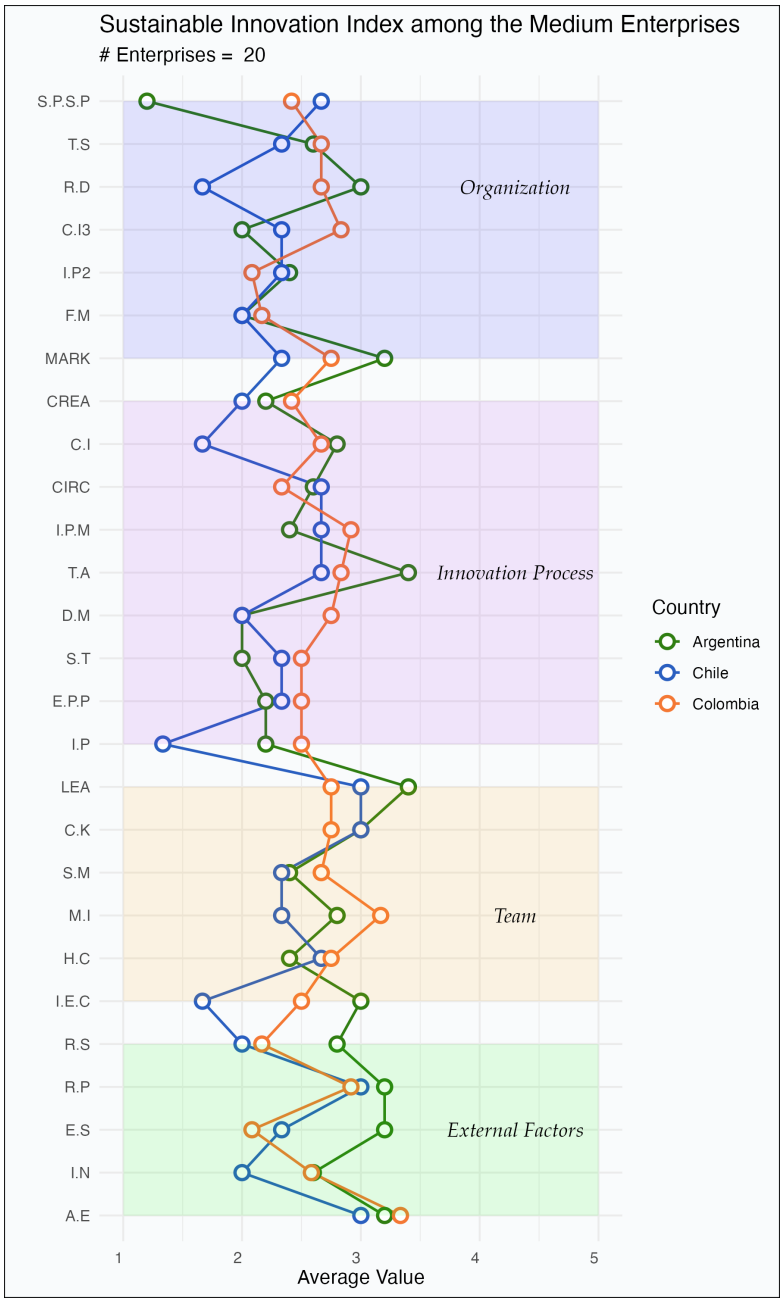

Figure 3.6: Comparison of the practices for Medium companies

Medium-sized companies in Colombia, Argentina, and Chile show low-to-medium levels of maturity in the factors evaluated, with average values equal to or below 3.5.

In the case of factors associated with **Organizational management**, the lowest factors in the three countries correspond to *intellectual property management (IP2)* and *financial management (F.M)*, which represent the greatest challenges in this area for medium-sized

companies in the three countries. In the particular case of Chile, *research and development (R&D)* is added as an additional management need. In the case of Argentina, procurement management with a focus on *sustainability (S.P.S.P)*.

In relation to **Innovation processes**, low levels of development can be observed in terms of innovation strategies, processes, and tools to support the development of sustainable innovations in medium-sized companies. In particular, Chilean and Argentine medium-sized companies have lower values compared with Colombian counterparts, with the lowest values being those associated with the *development of methodologies (D.M), sport tools (S.T)*, and *eco-innovation in products and processes*, thus representing the greatest needs of this group of companies to enhance their capacity for sustainable innovation.

Considering the factors associated with **Team management**, these show similar maturity results in medium-sized companies in the three countries, although *skills management and motivation to innovate* emerge as the two lowest-performing practices.

Finally, in relation to the values associated with **External Factors**, it is worth mentioning that companies try to take advantage of opportunities in the *environment (A.E.)* through collaboration *(I.N.)*. However, the regulatory environment (*E.S., RP*, medium-low) and government incentives (low *R.S*) are not mature enough to promote the development of sustainable innovations.

3.3.3 Small companies at Colombia, Argentine,Chile

Regarding the small companies in total 13 enterprises were considered in the set of answers (Figure 3.7). Small Colombian companies report low-to-medium levels of maturity in most practices compared to Argentina and Chile. In other words, small Colombian companies face difficulties in terms of organizational management, formalization and support for innovation processes, team management, and an adequate context for taking advantage of opportunities to carry out sustainable innovations.

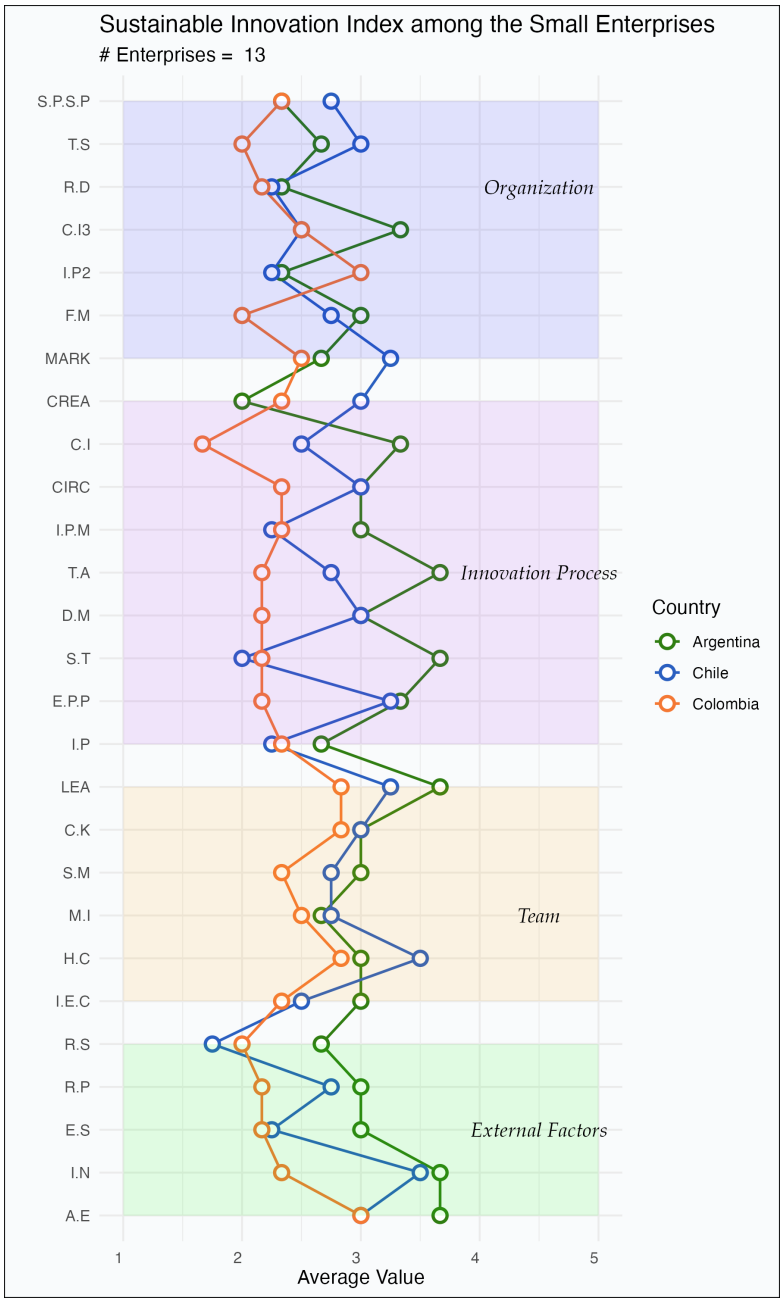

Figure 3.7: Comparison of the practices for Small companies

For their part, Argentina and Chile show better, but not greatly superior, levels of maturity. In particular, small Argentine companies show better levels in all four categories, representing better conditions (especially contextual and at the level of innovation processes) for carrying out sustainable innovations compared to Chile and Colombia.

3.3.4 Micro companies at Colombia, Argentine,Chile

Within the micro size companies in the Colombian, Argentinian and Chilean context 15 enterprises were considered, Figure 3.8 present the results obtained.

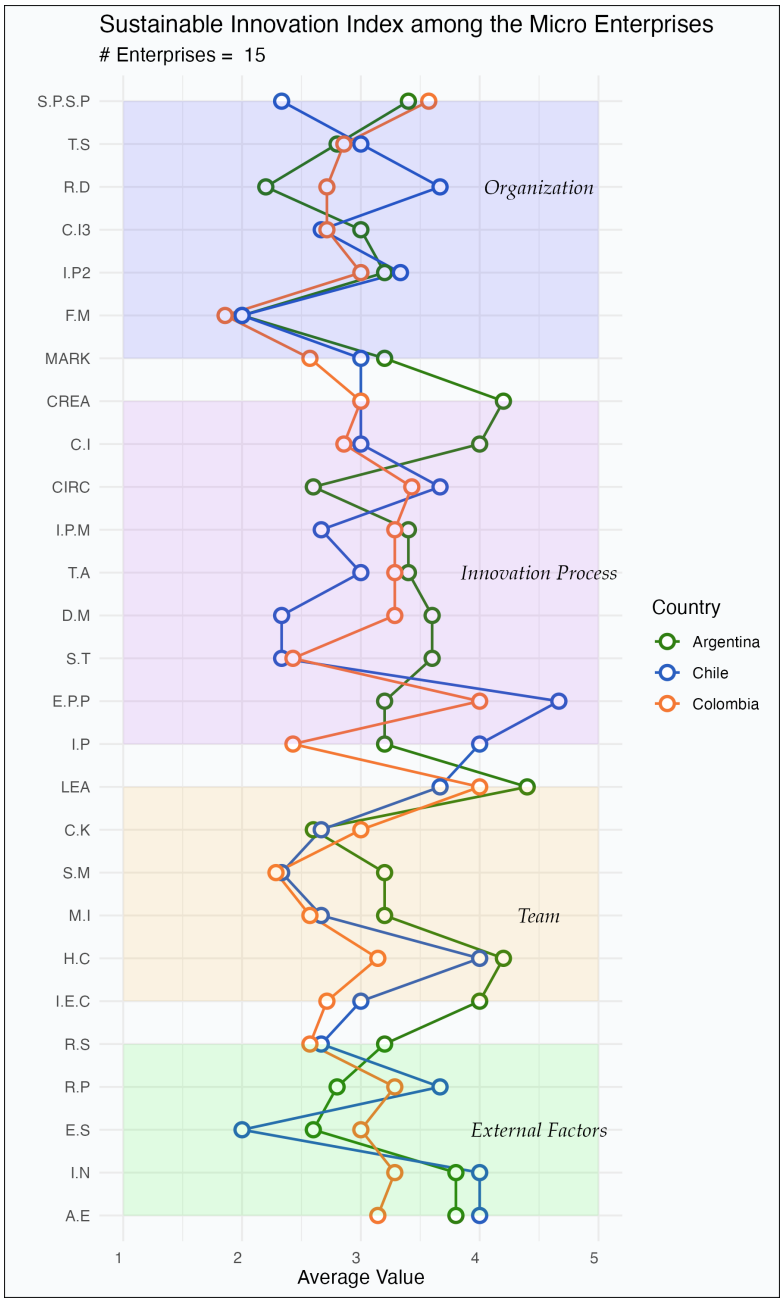

Figure 3.8: Comparison of the practices for micro companies

In general, Colombian, Chilean, and Argentine microenterprises show heterogeneous behavior

in terms of their level of maturity in each practice.

At the organizational level, microenterprises in all three countries have needs in relation to financial management, with acceptable levels of maturity (medium-high) in relation to the other practices in this group. In terms of innovation processes, Argentine microenterprises seem to have the most consolidated innovation processes and tools when comparing the three countries, especially in r*elation to creativity, customer integration, design methodologies, and support tools*. In terms of team management, micro-enterprises in the three countries exhibit similar behaviors, although Argentine micro-enterprises score higher *in motivation to innovate* and *skills management*. *Human capital management* and *leadership* excel as the highest-rated practices in this category. Finally, in terms of environment and context, micro-enterprises in the three countries report medium-high levels of maturity, indicating a moderately favorable environment for sustainable innovation.

3.4 Closure of WP1 of TechTraPlastiCE

The present deliverable closure the Work Package 1 (WP1) of the TechTraPlastiCE project. As stated in description of action, this WP aimed to define instruments, create capacities and guide Universities in identifying and understanding key barriers and leverage points of the local plastic companies to encourage collaboration opportunities with industries in each participating partner institution. After navigating through this WP, universities will identify the most appropriate industries and sectors to engage in the later stages of the projects, identifying fundamental driving forces for innovation as illustrated in Figure 3.9.

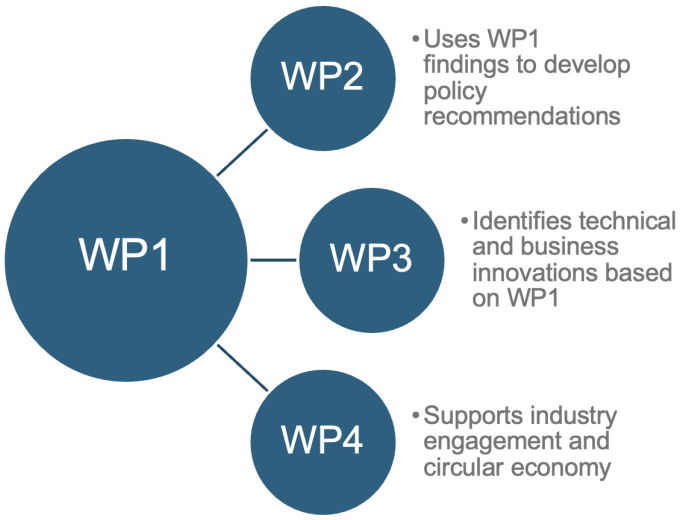

Figure 3.9: WP1 baseline for TechTraplastiCE Project

The deliverable 1.1 of WP1 under the TechTraPlastiCE project establishes a comparative framework to understand the barriers and benefits of applying local plastics legislation in Argentina, Chile, and Colombia. Its main objective is to provide a shared baseline for analyzing regulatory structures, institutional gaps, and key stakeholders across the plastic value chain, supporting the transition toward a circular economy in Latin America.

The framework was developed collaboratively among partner universities through four steps: identifying national legislation on plastics and circular economy, analyzing secondary data to detect barriers and enablers, validating results during the project's kick-off workshop in Nancy, France (March 2025), and synthesizing country-level reports into a regional comparative analysis. This process produced a coherent overview of similarities, differences, and shared challenges that shape circular plastics implementation in the three countries.

Findings reveal that Argentina, Chile, and Colombia have all advanced in enacting regulations targeting single-use plastics, recycling, and circular strategies, but uneven implementation persists. Chile stands out with a consolidated national framework and measurable goals; Colombia has progressed rapidly with a national circular economy strategy and inclusion of recyclers; Argentina demonstrates strong local initiatives but lacks a unified national policy. Common challenges include limited enforcement, uneven territorial application, insufficient incentives for circular innovation, weak coordination among stakeholders, and limited adoption by small and medium enterprises. Analysis of the plastic value chain shows that Argentina and Colombia produce plastic resins domestically, while Chile depends on imports. Municipalities

play a central role in waste management, yet infrastructure gaps remain, especially in rural areas. The formalization of recyclers is most advanced in Colombia, whereas cooperatives in Argentina and Chile operate with varying levels of support. Informal actors continue to play a critical role but lack the incentives and institutional frameworks needed for full integration into circular systems. Across all three countries, the early stages of the plastics value chain (production and manufacturing) are more structured, while post-consumption stages (collection, recycling, and valorization) rely heavily on informal labor and local government initiatives. Strengthening collaboration between universities, industry, and policymakers emerges as a key opportunity to accelerate circular innovation, improve regulatory coherence, and develop targeted capacity-building tools.

Overall, this deliverable provides a foundational understanding of the regional regulatory landscape and the conditions affecting circular plastics adoption. It emphasizes the need for coherent policy design, stronger enforcement mechanisms, investment in waste valorization systems, and inclusive collaboration across sectors. These insights will guide the next stages of the TechTraPlastiCE project, informing the development of practical tools, policy recommendations, and innovation pilots that foster a more circular and sustainable plastics economy in Latin America.

The deliverable 1.2 of WP1 provided a comparative analysis of the plastics industry in Argentina, Chile, and Colombia from a circular economy perspective. The plastics industry is a central pillar of the global economy and a major driver of environmental challenges. Global plastic production has grown from 2 million tons in 1950 to 435 million tons in 2020 and is projected to exceed 1.3 billion tons by 2060 if no corrective policies are implemented. This surge has led to parallel increases in waste generation, with less than 20% of plastics being recycled worldwide. In Latin America, recycling rates are below 10%, largely due to limited infrastructure and persistent informality in waste management. Within this context, Argentina, Chile, and Colombia exemplify both the opportunities and structural barriers to building a circular plastics economy.

It aims to identify gaps, opportunities, and strategic actors that can drive the transition towards a more sustainable plastics value chain. The analysis is based on a common methodological framework and incorporates inputs gathered by national university teams through surveys, interviews, industrial visits, and literature reviews. The information was then systematized and comparatively analyzed to highlight trends, differences, and shared challenges. The findings show that, despite regulatory advances and some innovative practices, the plastics sector in the three countries remains heavily dependent on virgin materials, suffers from low recycling

rates, and faces structural challenges such as 1) fragmented governance, 2) weak integration of informal recyclers or waste pickers, and 3) limited university-industry collaboration.

In the three countries, the plastics sector plays a key economic and employment role, supplying multiple industries such as packaging, construction, agriculture, and automotive manufacturing. Argentina's industry comprises around 2,800 firms and more than 150,000 waste pickers, combining formal and informal systems of collection and recycling. Chile's industry, fully dependent on imported resins, has a smaller but more concentrated structure of 520 companies, backed by robust regulatory instruments such as the Extended Producer Responsibility (EPR) Law and the Circular Economy Roadmap to 2040. Colombia contributes 2.9% of its manufacturing GDP through a highly fragmented industrial base dominated by micro and small enterprises, though it benefits from domestic polymer production and a progressive legal framework that includes the 2022 plastics law and the National Circular Economy Strategy (ENEC). Geographically, production and consumption are concentrated around major metropolitan regions—Buenos Aires, Santiago, and Bogotá—while recycling and recovery remain decentralized and underdeveloped. Across the three countries, polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), polyethylene terephthalate (PET), and polystyrene (PS) dominate consumption, mainly in packaging, which represents about half of total use. Construction, agroindustry, mining, and consumer goods follow as major applications, underlining plastics' economic importance but also their environmental footprint.

Advancing toward a circular economy in the plastics sector requires a systemic approach that goes beyond technical solutions. It calls for multi-actor collaboration, territorial governance, and the mobilization of universities as key players in fostering inclusive innovation and sustainable transformation. Indeed, several opportunities were identified as the greatest potential for circular transition: (1) waste management and recycling, (2) product transformation and manufacturing through eco-design and recycled inputs, (3) production of recycled or bio-based resins, and (4) post-consumption models that promote reuse and reverse logistics. Progress in these areas depends on improving infrastructure, integrating informal recyclers, investing in technology, and developing coherent policies that align incentives along the value chain.

Lastly, this deliverable 1.3 make the focus on the companies of the three countries to make the link between the Global and local perspectives. Large, medium, small and micro companies were contacted in order to better understand the difficulties and pain points that can be converted into opportunities of action for TechTraPlastiCE consortium. THey stated structural limitations regarding the differences practices evaluated. Nevertheless, there are emerging opportunities. Regulatory advances in Chile and Colombia, together with Argentina's strong

civil society and industrial base, open pathways for coordinated action. Common opportunities include expanding EPR mechanisms, upgrading recycling infrastructure, promoting eco-design, incentivizing green markets, and strengthening consumer education. These elements wil be explore in more detail in WP3 to encourage multi-actor initiatives to enhance the reuse of plastic involving waste pickers' organizations, companies, and the local public sectors, taking advantage of the University's articulation capacities. This WP will address the involvement of key players in the circular economy challenge that overpasses the margins of industries' actions: the waste pickers' organizations and the local public sectors. Intersectoral collaboration—linking governments, academia, industry, and social organizations—appears as a decisive factor for scaling circular models.

Milestone Achieved – TechTraPlastiCE WP1

- **MS1: Industry engagement and participation in project consultations**

A total of **68 companies** across Colombia, Argentina, and Chile actively participated in the implementation of Deliverable 1.3, demonstrating strong engagement from the regional plastics industry. The detailed list of companies contacted by each Latin American higher education institution (HEI) is available in the internal documentation of the TechTraPlastiCE project.

Additional achievements within WP1 include:

- **Integration of master's students** from Colombia and Chile, strengthening academic collaboration and capacity-building.
- **Dissemination of preliminary results** in international research conferences, enhancing the project's visibility within the scientific community.
- **Ongoing communication and coordination** among partner institutions across the three countries, fostering a cohesive regional approach to circular plastics research.

4 Conclusions

Overall, the three countries show a comparable average assessment. In all cases, large companies demonstrate strong performance in sustainable innovation, especially in Colombia and Chile, where they distinctly position themselves as leaders in this domain. This can be explained by the presence of a more consolidated structure that offers greater resource availability for innovation in this domain. Another similarity between the countries is that the profile of micro-enterprises shows the greatest variability in their assessments, due to their flexible structure, which benefits some practices but hinders others. In general, medium-sized, small, and micro-enterprises showed various weaknesses, highlighting the need for support and training to carry out sustainable innovation projects.

Applying the assessment model to companies creates a link between academia and industry. It generates a win-win relationship. For the university, this process yields data that validate the proposed evaluation tool and enable the analysis of sustainable innovation capabilities across countries. For companies, it offers a practical diagnostic assessment of their activities and processes, supporting informed decision-making to strengthen these capabilities. Additionally, for this project (Erasmus), the application of this assessment allows the establishment of relationships with companies for future work packages, as these companies can participate in the implementation of projects. In addition, trade associations expressed interest in continuing to participate in the project, contributing their expert opinion on the plastics industry and serving as a link with companies.

This task also produces academic results by engaging master's and undergraduate students, enabling them to use this work as part of their final graduation projects. In terms of research, an article was presented at the IAMOT 2025 conference with the formulation of the evaluation model. In addition, work is currently underway on an article to be presented at the Iamot 2026

conference (the initial abstract has already been submitted). This article is being produced in cooperation between the Universidad de Santiago de Chile, Universidad Nacional de Colombia Universidad Central de Colombia.

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A

Technical Annex of the

A.1 Total of Answers

Company	Size	A.E	I.N	E.S	R.P	R.S	I.E.	H.C	M.I	S.M	C.K	LEA	I.P	E.P.	S.T	D.M	T.A	I.P.I	CIR	C.I	CRI	MA	F.M	I.P2	C.I3	R.D	T.S	S.P.
COL1	Large	4	3	3	3	3	1	3	3	3	3	3	4	3	3	4	4	3	3	3	3	3	3	4	2	3	3	3
COL2	Large	4	4	5	4	3	3	4	3	3	4	3	2	3	3	3	4	3	4	3	3	3	3	5	4	5	4	3
COL3	Large	4	4	4	3	2	3	3	3	2	3	3	3	3	3	2	3	3	3	3	3	4	3	3	3	3	4	2
COL4	Large	4	3	4	4	3	5	4	4	5	4	3	4	4	3	5	4	3	4	4	4	4	3	4	4	4	4	4
COL5	Large	5	5	5	5	5	5	5	5	5	4	5	5	4	3	5	4	5	5	5	5	4	5	5	5	5	5	5
COL6	Large	3	2	1	3	3	1	2	2	2	3	3	5	3	4	4	4	4	3	3	3	3	3	4	2	3	2	2
COL7	Large	5	4	4	5	4	5	4	3	3	3	4	3	4	3	4	3	3	4	4	4	3	2	5	3	3	4	3
COL8	Large	4	4	5	5	5	4	3	2	3	4	3	3	4	3	3	3	3	4	3	4	3	3	3	3	3	4	4
COL8	Large	4	5	3	5	5	5	5	5	5	4	5	4	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5
COL10	Large	3	2	3	4	2	3	3	2	3	3	3	5	2	3	2	5	4	3	3	3	3	2	4	4	5	4	4
COL11	Large	3	1	3	3	1	2	3	3	2	3	3	3	3	3	3	4	3	4	3	3	3	3	3	4	4	4	3
COL12	Medium	3	4	3	5	4	2	4	5	3	3	4	4	5	4	5	5	5	4	3	3	4	4	2	4	4	4	5
COL13	Medium	3	2	1	2	1	3	3	3	3	3	3	3	1	4	3	4	4	1	3	2	3	1	2	3	1	4	3
COL14	Medium	3	1	2	4	3	3	1	3	2	3	3	2	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1
COL15	Medium	3	2	2	3	1	2	3	2	3	3	2	1	2	2	2	2	2	2	3	2	4	1	1	2	4	2	1
COL16	Medium	4	2	2	3	2	3	3	2	2	3	2	2	2	2	2	2	3	3	2	1	2	2	2	3	1	1	1
COL17	Medium	4	2	1	2	2	3	3	3	3	3	3	1	2	1	3	3	2	2	1	3	2	1	2	1	3	2	2
COL18	Medium	4	3	3	3	3	4	3	3	3	3	4	2	2	2	3	3	3	2	3	3	2	3	2	2	3	4	2
COL19	Medium	3	2	1	2	2	1	2	5	4	3	3	3	2	2	2	3	3	2	3	2	3	3	3	4	3	3	2
COL20	Medium	3	2	1	2	2	1	2	2	1	2	1	2	2	1	1	2	2	2	3	1	3	1	1	2	3	2	2
COL21	Medium	3	2	3	3	2	2	3	3	2	1	1	3	5	3	3	3	3	3	3	5	3	3	2	5	3	4	5
COL22	Medium	3	4	2	3	2	2	2	3	2	2	3	3	4	4	4	3	3	4	3	3	3	3	4	4	3	3	3
COL23	Medium	4	5	4	3	2	4	4	4	4	4	4	4	2	4	4	3	4	2	3	3	3	3	2	3	3	2	2
COL24	Micro	2	4	3	2	2	2	2	1	2	2	2	2	3	2	2	3	3	2	1	2	3	1	2	2	3	2	2
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(continued)

Company	Size	A.E	I.N	E.S	R.P	R.S	I.E.	H.C	M.I	S.M	C.K	LE/	I.P	E.P.	S.T	D.M	T.A	I.P.I	CIR	C.I	CRI	MA	F.M	I.P2	C.I3	R.D	T.S	S.P.
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ARG9	Medium	3	3	3	2	2	1	2	3	2	3	4	5	3	3	2	4	3	3	3	3	3	4	5	2	4	2	1
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CHI2	Large	3	2	3	3	3	3	4	4	5	4	5	5	5	5	5	5	5	3	5	5	5	5	5	4	5	5	4
CHI3	Medium	4	2	4	3	2	3	4	3	4	5	5	2	2	4	3	4	4	2	3	4	3	4	3	3	3	3	3
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CHI5	Small	2	4	3	3	3	1	3	2	3	3	3	3	4	2	4	3	3	3	3	3	3	3	2	2	4	4	4
CHI6	Small	3	4	2	3	1	2	3	2	2	2	2	1	2	2	4	2	2	3	2	2	4	2	2	1	1	2	1
CHI7	Small	3	3	2	3	2	3	3	2	2	3	3	1	2	1	1	2	1	3	2	3	3	2	2	3	1	2	1
CHI8	Micro	5	4	1	5	2	3	4	2	2	2	5	5	5	2	2	3	2	4	4	3	2	1	3	3	5	3	3
CHI9	Micro	2	3	3	3	3	1	3	1	1	2	1	2	4	1	1	1	1	2	1	1	2	1	2	1	1	1	1
CHI10	Micro	5	5	2	3	3	5	5	5	4	4	5	5	5	4	4	5	5	5	4	5	5	4	5	4	5	5	3
CHI11	Medium	2	2	2	3	2	1	2	2	1	2	2	1	3	1	1	1	1	3	1	1	2	1	2	1	1	1	3
CHI12	Medium	3	2	1	3	2	1	2	2	2	2	2	1	2	2	2	3	3	3	1	1	2	1	2	3	1	3	2

A.2 Questionnaire for the Task 1.3

Universidad de Santiago de Chile
Facultad de Ingeniería
Departamento de Ingeniería Industrial

FACULTAD DE INGENIERÍA
UNIVERSIDAD DE SANTIAGO DE CHILE

Indicador Aplicado

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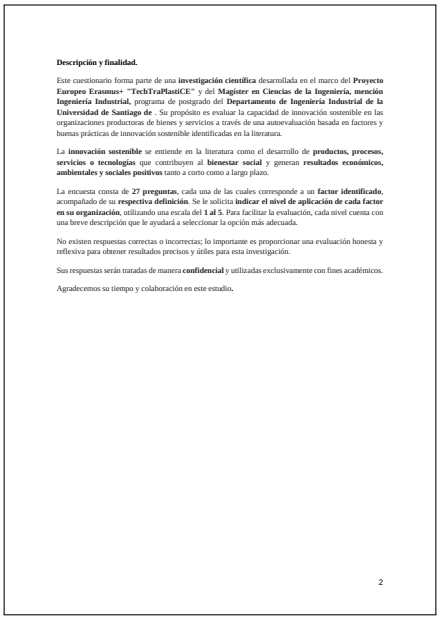
Profesor: Pavlo Santander; Lorena Delgado; Daniel Galvez

22 de Agosto, 2025



Descripción y finalidad.

Este cuestionario forma parte de una **investigación científica** desarrollada en el marco del **Proyecto Europeo Erasmus+ "TechTraPlastiCE"** y del **Magister en Ciencias de la Ingeniería, mención Ingeniería Industrial,** programa de postgrado del **Departamento de Ingeniería Industrial de la Universidad de Santiago de** . Su propósito es evaluar la capacidad de innovación sostenible en las organizaciones productoras de bienes y servicios a través de una autoevaluación basada en factores y buenas prácticas de innovación sostenible identificadas en la literatura.

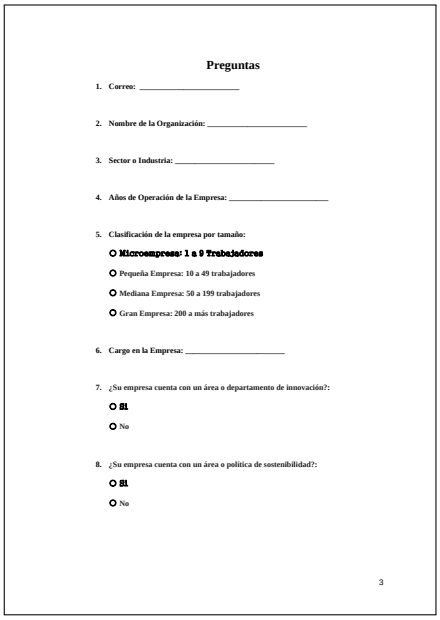
La **innovación sostenible** se entiende en la literatura como el desarrollo de **productos, procesos, servicios o tecnologías** que contribuyen al **bienestar social** y generan **resultados económicos, ambientales y sociales positivos** tanto a corto como a largo plazo.

La encuesta consta de **27 preguntas**, cada una de las cuales corresponde a un **factor identificado**, acompañado de su **respectiva definición**. Se le solicita **indicar el nivel de aplicación de cada factor en su organización**, utilizando una escala del **1 al 5**. Para facilitar la evaluación, cada nivel cuenta con una breve descripción que le ayudará a seleccionar la opción más adecuada.

No existen respuestas correctas o incorrectas; lo importante es proporcionar una evaluación honesta y reflexiva para obtener resultados precisos y útiles para esta investigación.

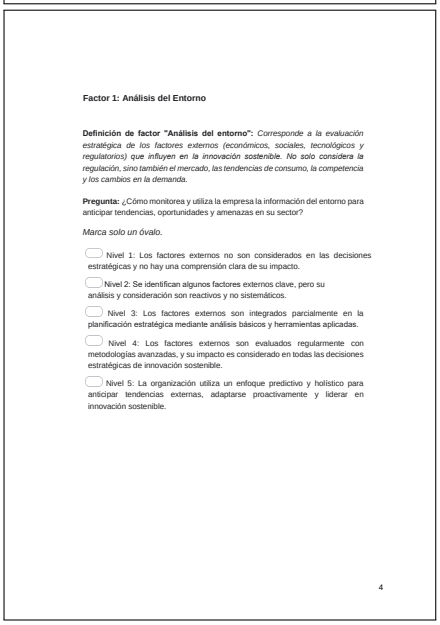
Sus respuestas serán tratadas de manera **confidencial** y utilizadas exclusivamente con fines académicos.

Agradecemos su tiempo y colaboración en este estudio.



Preguntas

1. **Correo:** _____
2. **Nombre de la Organización:** _____
3. **Sector o Industria:** _____
4. **Años de Operación de la Empresa:** _____
5. **Clasificación de la empresa por tamaño:**
   - **Microempresa: 1 a 9 Trabajadores**
   - **Pequeña Empresa: 10 a 49 trabajadores**
   - **Mediana Empresa: 50 a 199 trabajadores**
   - **Gran Empresa: 200 a más trabajadores**
6. **Cargo en la Empresa:** _____
7. **¿Su empresa cuenta con un área o departamento de innovación?:**
   - **SI**
   - **No**
8. **¿Su empresa cuenta con un área o política de sostenibilidad?:**
   - **SI**
   - **No**



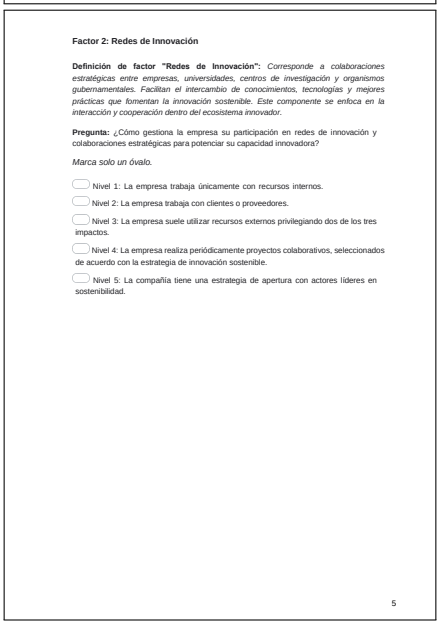
Factor 1: Análisis del Entorno

Definición de factor "Análisis del entorno": *Corresponde a la evaluación estratégica de los factores externos (económicos, sociales, tecnológicos y regulatorios) que influyen en la innovación sostenible. No solo considera la regulación, sino también el mercado, las tendencias de consumo, la competencia y los cambios en la demanda.*

Pregunta: ¿Cómo monitorea y utiliza la empresa la información del entorno para anticipar tendencias, oportunidades y amenazas en su sector?

Marca solo un óvalo.

- Nivel 1: Los factores externos no son considerados en las decisiones estratégicas y no hay una comprensión clara de su impacto.
- Nivel 2: Se identifican algunos factores externos clave, pero su análisis y consideración son reactivos y no sistemáticos.
- Nivel 3: Los factores externos son integrados parcialmente en la planificación estratégica mediante análisis básicos y herramientas aplicadas.
- Nivel 4: Los factores externos son evaluados regularmente con metodologías avanzadas, y su impacto es considerado en todas las decisiones estratégicas de innovación sostenible.
- Nivel 5: La organización utiliza un enfoque predictivo y holístico para anticipar tendencias externas, adaptarse proactivamente y liderar en innovación sostenible.



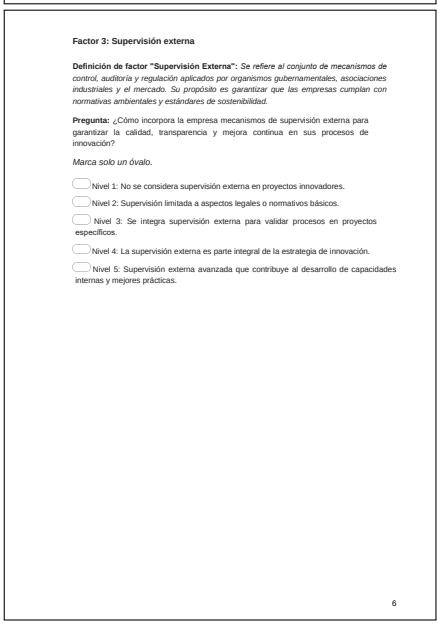
Factor 2: Redes de Innovación

Definición de factor "Redes de Innovación": *Corresponde a colaboraciones estratégicas entre empresas, universidades, centros de investigación y organismos gubernamentales. Facilitan el intercambio de conocimientos, tecnologías y mejores prácticas que fomentan la innovación sostenible. Este componente se enfoca en la interacción y cooperación dentro del ecosistema innovador.*

Pregunta: ¿Cómo gestiona la empresa su participación en redes de innovación y colaboraciones estratégicas para potenciar su capacidad innovadora?

Marca solo un óvalo.

- Nivel 1: La empresa trabaja únicamente con recursos internos.
- Nivel 2: La empresa trabaja con clientes o proveedores.
- Nivel 3: La empresa suele utilizar recursos externos privilegiando dos de los tres impactos.
- Nivel 4: La empresa realiza periódicamente proyectos colaborativos, seleccionados de acuerdo con la estrategia de innovación sostenible.
- Nivel 5: La compañía tiene una estrategia de apertura con actores líderes en sostenibilidad.



Factor 3: Supervisión externa

Definición de factor "Supervisión Externa": *Se refiere al conjunto de mecanismos de control, auditoría y regulación aplicados por organismos gubernamentales, asociaciones industriales y el mercado. Su propósito es garantizar que las empresas cumplan con normativas ambientales y estándares de sostenibilidad.*

Pregunta: ¿Cómo incorpora la empresa mecanismos de supervisión externa para garantizar la calidad, transparencia y mejora continua en sus procesos de innovación?

Marca solo un óvalo.

- Nivel 1: No se considera supervisión externa en proyectos innovadores.
- Nivel 2: Supervisión limitada a aspectos legales o normativos básicos.
- Nivel 3: Se integra supervisión externa para validar procesos en proyectos específicos.
- Nivel 4: La supervisión externa es parte integral de la estrategia de innovación.
- Nivel 5: Supervisión externa avanzada que contribuye al desarrollo de capacidades internas y mejores prácticas.

Factor 4: Presión Regulatoria

Definición de factor "Presión Regulatoria": *Corresponde a normativas y exigencias legales que obligan a las empresas a adoptar prácticas más sostenibles. Puede manifestarse en restricciones ambientales, requisitos de eficiencia energética o metas de reducción de emisiones. Representa el lado obligatorio de la regulación, es decir, las reglas que las empresas deben seguir para operar dentro de la legalidad.*

Pregunta: ¿Cómo gestiona la empresa el cumplimiento de normativas y exigencias legales para transformar la presión regulatoria en una oportunidad de innovación?

Marca solo un óvalo.

- Nivel 1: La empresa no considera normativas en sus procesos de innovación.
- Nivel 2: Cumple con normativas básicas para evitar sanciones legales.
- Nivel 3: Adopta regulaciones como oportunidades de mejora.
- Nivel 4: La supervisión externa es parte integral de la estrategia de innovación.
- Nivel 5: Lidera en el cumplimiento normativo, promoviendo regulaciones sostenibles en su industria.

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Factor 5: Apoyo Regulatorio

Definición de factor "Apoyo Regulatorio": *Hace referencia a políticas y programas gubernamentales diseñados para fomentar la innovación sostenible, como financiamiento, asesoramiento y certificaciones ecológicas. Es la contraparte de la presión regulatoria, pues representa el incentivo en lugar de la obligación.*

Pregunta: ¿Cómo gestiona la empresa el acceso y la participación en políticas y programas gubernamentales diseñados para fomentar la innovación?

Marca solo un óvalo.

- Nivel 1: No se busca apoyo regulatorio para innovaciones.
- Nivel 2: Participa en programas de apoyo regulatorio de forma limitada.
- Nivel 3: Utiliza incentivos regulatorios en proyectos innovadores seleccionados.
- Nivel 4: Apoyo regulatorio es parte de la estrategia para innovación sostenible.
- Nivel 5: Trabaja activamente con entes regulatorios para impulsar innovaciones de triple impacto.

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Factores Internos asociados al Equipo Humano

Factor 6: Comunicación interna y Externa

Definición de factor "Comunicación": *Corresponde al proceso mediante el cual la empresa facilita el intercambio de información entre los equipos de trabajo, fomentando la colaboración y la integración del conocimiento en iniciativas basadas en la innovación sostenible.*

Pregunta: ¿Cómo gestiona la empresa la comunicación interna y externa de sus proyectos de innovación?

Marca solo un óvalo.

- Nivel 1: Los proyectos desarrollados dentro de la empresa son conocidos sólo por dirección y diseño.
- Nivel 2: Al menos una vez por año, usted organiza una actividad de comunicación para todos los empleados
- Nivel 3: Usted comunica regularmente los proyectos de la empresa a todos los empleados. La mayoría del personal tiene la convicción de pertenecer a una empresa dinámica.
- Nivel 4: Usted ha puesto en marcha una estrategia de comunicación. Puede dar ejemplos de información difundida: fechas de comunicación, medios utilizados, nivel de detalle implementado, etc.
- Nivel 5: Usted mantiene un ritmo regular de anuncios sobre sus innovaciones. Sus comunicaciones periódicas son esperadas por el mercado y les permiten mantener su imagen de líder.

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Factor 7: Capital Humano

Definición de factor "Capital Humano": *Se define como el conjunto de conocimientos, habilidades, experiencia y capacidades adquiridas por los empleados, que influyen directamente en la capacidad de la empresa para desarrollar innovaciones que abarquen el triple impacto.*

Pregunta: ¿En qué medida los conocimientos, habilidades y experiencias del equipo de trabajo están alineados con los objetivos de innovación de la empresa y se fortalecen continuamente?

Marca solo un óvalo.

- Nivel 1: Los conocimientos, habilidades y capacidades de los empleados no están alineados con los objetivos de Sostenibilidad.
- Nivel 2: Existen esfuerzos individuales por contribuir a la Innovación Sostenible.
- Nivel 3: Los conocimientos, habilidades y capacidades adquiridos son considerados en la planificación de proyectos la innovación Sostenible, con formación básica.
- Nivel 4: Los equipos están alineados y capacitados para contribuir a la innovación sostenible.
- Nivel 5: Los conocimientos, habilidades y experiencia de los empleados se gestionan estratégicamente para liderar y sostener la innovación Sostenible como ventaja competitiva.

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Factor 8: Motivación para la Innovación

Definición de factor "Motivación para la innovación": *Hace referencia al nivel de compromiso, entusiasmo y voluntad de los empleados para involucrarse en el desarrollo de soluciones innovadoras. No se trata solo de poseer conocimientos técnicos, sino de querer aplicarlos activamente en la transformación sostenible de la empresa.*

Pregunta: ¿Cómo fomenta la empresa la motivación de sus colaboradores para impulsar la innovación?

Marca solo un óvalo.

- Nivel 1: No existe una cultura de motivación hacia la innovación.
- Nivel 2: La motivación hacia la innovación depende de iniciativas individuales.
- Nivel 3: Se implementan programas de motivación para fomentar la participación en proyectos innovadores.
- Nivel 4: Existe un sistema estructurado de incentivos para la innovación.
- Nivel 5: La motivación hacia la innovación está integrada en la cultura organizacional como un pilar estratégico.

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Factor 9: Gestión de Habilidades del equipo

Definición de factor "Gestión de habilidades del equipo": *Corresponde al conjunto de estrategias y procesos que la empresa implementa para desarrollar, actualizar y administrar las competencias del equipo, asegurando que estas se alineen con las necesidades de la innovación.*

Pregunta: ¿Cómo gestiona la empresa el desarrollo y la mejora de las habilidades del equipo para fortalecer la innovación?

Marca solo un óvalo.

- Nivel 1: No se identifican ni gestionan las competencias del equipo.
- Nivel 2: Se realiza una gestión básica de competencias con registros limitados.
- Nivel 3: Las competencias del equipo están mapeadas y se gestionan periódicamente.
- Nivel 4: La gestión de competencias está alineada con los objetivos de innovación de la organización.
- Nivel 5: La gestión de competencias incluye planes de formación y desarrollo continúo adaptados a la innovación.

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Factor 10: Capitalización del Conocimiento

Definición de factor "Capitalización del conocimiento": *Corresponde al proceso de documentación, almacenamiento y reutilización del conocimiento generado en la empresa, asegurando que las mejores prácticas y aprendizajes en innovación sean accesibles y aplicables a futuro.*

Pregunta: ¿Cómo gestiona la empresa la adquisición, almacenamiento y aplicación del conocimiento generado en sus procesos de innovación?

Marca solo un óvalo.

- Nivel 1: No se capitalizan los conocimientos adquiridos en proyectos anteriores.
- Nivel 2: Se registra informalmente información de proyectos pasados.
- Nivel 3: Existe un sistema básico para almacenar y acceder a conocimientos adquiridos.
- Nivel 4: La capitalización de conocimientos está formalizada y se utiliza activamente en nuevos proyectos.
- Nivel 5: Los conocimientos adquiridos son un activo estratégico y están disponibles en una plataforma centralizada

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Factor 11: Liderazgo

Definición de factor "Liderazgo": *Hace referencia a la capacidad de los directivos y gerentes para promover la sostenibilidad, orientar a los equipos hacia objetivos estratégicos de innovación y gestionar eficientemente el capital humano.*

Pregunta: ¿Cómo influye el liderazgo en la promoción y desarrollo de la innovación dentro de la empresa?

Marca solo un óvalo.

- Nivel 1.El liderazgo no está enfocado en la promoción de la innovación.
- Nivel 2: Algunos líderes promueven iniciativas de innovación de forma limitada.
- Nivel 3: El liderazgo apoya proyectos innovadores alineados con objetivos organizacionales.
- Nivel 4: Los líderes son agentes de cambio que impulsan la cultura de innovación.
- Nivel 5: El liderazgo está completamente comprometido y orientado hacia la innovación sostenible y colaborativa.

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Factores Internos asociados al Proceso de Innovación

Factor 12: Portafolio de Innovación

Definición de factor "Portafolio de Innovación": *Se refiere a la gestión estratégica de proyectos de innovación, asegurando su alineación con la visión de la empresa. Administrar el portafolio de proyectos permite controlar el ritmo de salida de novedades, evitar la congestión de recursos, y no concentrarse exclusivamente en el corto plazo en prejuicio del largo plazo.*

Pregunta: ¿Qué acciones ha implementado su organización para estructurar, priorizar y gestionar de manera equilibrada los proyectos a corto, mediano y largo plazo

Marca solo un óvalo.

- Nivel 1: No dispone en este momento de una lista formal actualizada de sus proyectos actuales.
- Nivel 2: Dispone de una primera lista formal de proyectos que contiene datos como la fecha de lanzamiento de un proyecto, el nombre de su responsable, etc.
- Nivel 3: Puede listar algunos indicadores financieros que sirven para la priorización de sus proyectos (presupuesto, rendimiento estimado de la inversión, volumen de negocio, etc.)
- Nivel 4: Tiene una lista de miembros del comité el informe de la última reunión. El comité valida los resultados intermedios y asigna recursos a los diferentes proyectos. Hay registro de proyectos a corto, mediano y largo plazo.
- Nivel 5: Puede nombrar entre sus proyectos actuales, proyectos a corto, mediano y largo plazo, y diferenciar aquellos que se encuentran en etapa de idea, concepto,
prototipo, o próximo a la comercialización.

15

Factor 13: Ecoinnovación en productos y procesos

Definición de factor "Ecoinnovación en productos y procesos": *Se refiere a la implementación de innovaciones tecnológicas y organizativas que mejoran el desempeño ambiental de una empresa, optimizando el uso de recursos naturales y reduciendo los impactos ambientales de la producción industrial.*

Pregunta: ¿Cómo integra la empresa criterios de sostenibilidad y ecoinnovación en el desarrollo de sus productos y procesos?

Marca solo un óvalo.

- Nivel 1: No se consideran criterios ambientales en productos ni procesos. No existen métricas para evaluar el impacto ambiental.
- Nivel 2: Se incorporan criterios ambientales de manera limitada, con mejoras puntuales en materiales o eficiencia. Uso básico de tecnologías limpias en algunos procesos.
- Nivel 3: Desarrollo de productos con diseño optimizado para menor impacto ambiental. Implementación de tecnologías limpias en procesos clave y métricas iniciales de sostenibilidad.
- Nivel 4: Integración de estrategias de economía circular en productos y procesos. Uso avanzado de tecnologías limpias, reciclaje y eficiencia en toda la cadena de valor.
- Nivel 5: Innovación completamente sostenible. Productos diseñados para la circularidad total y procesos optimizados con tecnologías de vanguardia y mínimo impacto ambiental.

16

1. **Factor 14: Herramientas de Apoyo** *

Definición de factor "Herramientas de Apoyo": *Corresponde al uso de tecnologías y sistemas que facilitan la implementación de innovaciones sostenibles, como software de simulación, modelado y herramientas de análisis de datos para evaluar la viabilidad de nuevos procesos.*

Pregunta: ¿Cómo utiliza la empresa herramientas tecnológicas y sistemas para facilitar la innovación y optimizar procesos?

Marca solo un óvalo.

- Nivel 1: No se utilizan herramientas de soporte para la innovación.
- Nivel 2: Uso de herramientas digitales básicas para la gestión de proyectos.
- Nivel 3: Se utilizan herramientas específicas para la innovación en departamentos aislados.
- Nivel 4: Las herramientas de soporte son utilizadas de manera integrada en toda la organización.
- Nivel 5: Uso avanzado y centralizado de herramientas que facilitan la colaboración y la innovación sostenible.

17

Factor 15: Metodologías de Diseño

Definición de factor "Metodologías de Diseño": *Hace referencia a estrategias de diseño utilizadas para desarrollar productos y procesos sostenibles, incluyendo ecodiseño, análisis de ciclo de vida (ACV) y estrategias de minimización de residuos.*

Pregunta: ¿Cómo utiliza la empresa metodologías de diseño para el desarrollo de productos, servicios o procesos innovadores?"

Marca solo un óvalo.

- Nivel 1: No se utilizan metodologías formales para el diseño de productos o servicios.
- Nivel 2: Uso esporádico de métodos básicos como especificaciones técnicas.
- Nivel 3: Implementación de metodologías estructuradas en proyectos específicos.
- Nivel 4: Metodologías de diseño integradas en el proceso de innovación de la empresa.
- Nivel 5: La compañía tiene una estrategia de apertura con actores líderes en sostenibilidad.

18

Factor 16: Organización de Tareas

Definición de factor "Organización de Tareas": *Corresponde a la estructuración eficiente de actividades dentro de los procesos de innovación, asegurando una asignación óptima de recursos, tiempos y responsabilidades en proyectos de desarrollo sostenible.*

Pregunta: ¿Cómo gestiona la empresa la estructuración y asignación de tareas dentro de sus proyectos de innovación?

Marca solo un óvalo.

- Nivel 1: No hay organización formal para las tareas de innovación.
- Nivel 2: Tareas asignadas de manera informal y sin coordinación clara.
- Nivel 3: Las tareas se organizan usando herramientas básicas de planificación.
- Nivel 4: Las tareas están claramente definidas y alineadas con los objetivos de cada proyecto.
- Nivel 5: Organización de tareas optimizada con herramientas avanzadas y colaboración multidisciplinaria.

19

Factor 17: Gestión de Proyectos de Innovación

Definición de factor "Gestión de Proyectos": *Hace referencia a la administración de recursos, plazos, riesgos y objetivos en el desarrollo de proyectos de innovación, garantizando su ejecución efectiva y su alineación con los principios de sostenibilidad.*

Pregunta: ¿Cómo gestiona la empresa los recursos, plazos, riesgos y metodologías en el desarrollo de sus proyectos de innovación?

Marca solo un óvalo.

- Nivel 1: No se aplica una gestión formal para los proyectos de innovación.
- Nivel 2: Existen responsables asignados, pero sin metodologías definidas.
- Nivel 3: Se implementan metodologías básicas de gestión de proyectos.
- Nivel 4: Gestión de proyectos alineada a la estrategia organizacional con herramientas específicas.
- Nivel 5: Gestión de proyectos avanzada, con evaluación de resultados y mejora continua.

20

Factor 18: Circularidad

Definición de factor "Circularidad": *Corresponde a estrategias de reciclaje, reutilización y reducción en los procesos productivos, junto con el uso de métricas para evaluar la eficiencia de estos cambios.*

Pregunta: ¿Cómo mide la empresa el impacto de sus estrategias de economía circular y qué tan integradas están en su modelo de negocio?

Marca solo un óvalo.

- Nivel 1: Producción basada en procesos lineales, alta dependencia de materias primas vírgenes y sin enfoque en reducción de residuos o emisiones.
- Nivel 2: Implementación básica de monitoreo de consumo energético y manejo limitado de residuos sólidos, sin estrategias integrales.
- Nivel 3: Adopción de prácticas de reutilización de subproductos, reciclaje mecánico y reducción inicial de emisiones.
- Nivel 4: Integración de análisis de ciclo de vida (ACV), diseño para reciclabilidad y estrategias para optimizar recursos energéticos y materiales.
- Nivel 5: Implementación de sistemas de economía circular avanzada, incluyendo recuperación de energía, métricas de compromiso, integración industrial y modelos de negocio basados en servicios.

21

Factor 19: Integración de Clientes

Definición de factor "Integración de Clientes": *Hace referencia a la incorporación de la retroalimentación y necesidades del cliente en el desarrollo de innovaciones, asegurando que los productos y procesos respondan a las expectativas del mercado y fomenten la adopción de soluciones sostenibles.*

Pregunta: ¿Cómo involucra la empresa a los clientes en el proceso de desarrollo e innovación de sus productos o servicios?

Marca solo un óvalo.

- Nivel 1: Su opinión solo es consultada al momento de presentarles el producto terminado.
- Nivel 2: Organiza ocasionalmente reuniones para que los diseñadores observen el uso que dan los clientes a los productos en situación real.
- Nivel 3: La observación de los clientes permite identificar pistas de proyectos, los proveedores son consultados para seleccionar los componentes del nuevo producto, algunos usuarios prueban los prototipos.
- Nivel 4: Sabe formalizar contratos de asociación para que cada actor contribuya al proyecto. Sabe utilizar estos proyectos para generar ideas de proyectos futuros, ya sea internos o en colaboración.
- Nivel 5: Usted puede describir la manera en la que son animadas esas comunidades de clientes/proveedores, y en que etapas de los proyectos las hace intervenir.

22

Factor 20: Creatividad

Definición de factor "Creatividad": *Corresponde a la generación de ideas innovadoras que permitan transformar productos, procesos y modelos de negocio hacia soluciones más sostenibles, eficientes y con menor impacto ambiental.*

Pregunta: ¿Cómo fomenta la empresa la generación de ideas innovadoras para transformar sus productos, servicios o procesos?

Marca solo un óvalo.

- Nivel 1: Las ideas generadas en la empresa nacen de iniciativas individuales.
- Nivel 2: Este trabajo generalmente está relacionado con problemas de calidad, mantenimiento o reclamos de los clientes.
- Nivel 3: Hay tiempo dedicado a la búsqueda de ideas en algunos departamentos de la empresa, utilizan algunas veces la "lluvia de ideas" para encontrar soluciones o nuevas ideas.
- Nivel 4: Varios empleados están capacitados para animar sesiones de creatividad. Estas sesiones son organizadas regularmente en el departamento de estudios, en las operaciones de marketing.
- Nivel 5: Varios empleados están capacitados, hay sesiones regulares integradas en diferentes procesos. La creatividad es utilizada para generar ideas de productos y servicios, mejorar la producción, etc.

23

Otros Factores Internos de la Organización

Factor 21: Marketing

Definición de factor "Marketing": *Hace referencia a estrategias de comunicación y posicionamiento para diferenciar productos sostenibles y generar valor en el mercado.*

Pregunta: ¿Cómo gestiona la empresa la relación con sus clientes y la información del mercado para impulsar la innovación?

Marca solo un óvalo.

- Nivel 1: No hay una relación duradera con los clientes.
- Nivel 2: El departamento comercial es el garante de la fidelidad del cliente.
- Nivel 3: Sigue la evolución de su portafolio de clientes: la proporción de ventas de cada familia de productos, la repartición de las ventas por segmento, etc.
- Nivel 4: Puede citar el tipo de información recogida por departamento: comercial, calidad, oficina de diseño, etc. Puede dar la última fecha de reunión entre los departamentos.
- Nivel 5: El análisis de los clientes es completo a un plazo de al menos 3 años, identificando el futuro de los clientes de la empresa. Este análisis es input para la gestión de todos los deptos. de la empresa.

24

Factor 22: Gestión Financiera

Definición de factor "Gestión Financiera": *Corresponde a la administración de recursos financieros para financiar proyectos de innovación sostenible y compras responsables.*

Pregunta: ¿Cómo administra la empresa los recursos financieros para financiar proyectos de innovación?

Marca solo un óvalo.

- Nivel 1: Autofinancia proyectos de acuerdo con los recursos financieros disponibles internamente.
- Nivel 2: Sólo solicita bancos para financiar sus proyectos: leasing, préstamo, etc.
- Nivel 3: Tiene un presupuesto dedicado al desarrollo de la innovación. Puede estimar los costos al desarrollar un proyecto y postula fondos de innovación.
- Nivel 4:Tiene un presupuesto dedicado al desarrollo de la innovación. Puede estimar los costos al desarrollar un proyecto y postula fondos de innovación.
- Nivel 5: Comparte el riesgo cuando desarrolla proyectos, ya sea que sea un portador o contribuyente. Usted puede citar start-ups cuyo financiamiento ha apoyado, proyectos de colaboración a largo.

25

Factor 23: Propiedad Intelectual

Definición de factor "Propiedad Intelectual": *Se refiere a la protección de innovaciones y tecnologías que contribuyen a la competitividad sostenible de la empresa.*

Pregunta: ¿Cómo se protegen y gestionan los activos de propiedad intelectual derivados de los procesos de innovación en la empresa?

Marca solo un óvalo.

- Nivel 1: Conoce poco la importancia de la propiedad intelectual.
- Nivel 2: Puede describir qué es una patente, una marca, una política de privacidad, pero no lo ha experimentado en su empresa.
- Nivel 3: Usted puede citar un proyecto para el cual ha elegido un modelo de protección o apertura. Antes de definir un nombre para el nuevo producto se asegura que son libres de derechos.
- Nivel 4: Usted puede describir cómo, durante un proyecto, intervienen para elegir un modelo de protección o de apertura.Sus marcas son consideradas como un vector de imagen para su empresa.
- Nivel 5: La PI está considerada como una fuente de valor. Sus especialistas combinan enfoque de vigilancia estratégica, la confidencialidad, la gestión de portafolio de marcas y patentes.

26

Factor 24: Mejora Contínua

Definición de factor "Mejora Contínua": *Corresponde a la evaluación y optimización constante de procesos para mejorar la eficiencia y reducir impactos ambientales.*

Pregunta: ¿De qué manera la empresa busca mejorar los procesos de innovación a lo largo del tiempo?

Marca solo un óvalo.

- Nivel 1: No ha definido un proceso particular para su desarrollo y no ha pensado formalizar su proceso para proyectos futuros.
- Nivel 2: Durante esta reunión, junto al equipo de proyecto se buscó identificar aquello que hubiera podido hacerse "mejor" (más económico, más rápido, etc).
- Nivel 3: Análisis retrospectivo formalizado resaltando aquello que hayan encontrado particularmente positivo y aquello que podría ser mejorado en los proyectos futuros.
- Nivel 4: Puede citar indicadores, diferentes a los financieros, que usa para seguir su proceso de innovación (tiempo promedio por etapa, número de proyectos en curso en cada etapa, etc.).
- Nivel 5: Usted posee referenciales de calidad específicos al proceso de innovación. Estos han sido construidos conforme a las normas.

27

Factor 25: Investigación y Desarrollo

Definición de factor "Investigación y Desarrollo": *Hace referencia al desarrollo de nuevas tecnologías, productos y procesos orientados a la innovación sostenible.*

Pregunta: ¿Cómo se sostienen los procesos de investigación y desarrollo que enriquecen la capacidad de innovación en la empresa?

Marca solo un óvalo.

- Nivel 1: Nadie está a cargo de la I + D.
- Nivel 2: Puede citar un ejemplo de proyecto I+D iniciado en la empresa, y para el cual, han hecho estudios, el proyecto lo realiza practicantes.
- Nivel 3: Hay una persona encargada de proyectos de I+D y listar los diferentes proyectos bajo su cargo. Rango de duración de meses hasta un año.
- Nivel 4: Usted puede citar un proyecto a un plazo de 3 años, para el cual ha desarrollado una alianza con un laboratorio de investigación. Tiene personal técnico, ingenieros e investigadores que trabajan en conjunto.
- Nivel 5: Su estructura I+D desarrolla programas de investigación colaborativa. Puede citar varios proyectos con una duración de más de 3 años (finalizado o en curso), teniendo un imperativo de desarrollo colaborativo con otras estructuras.

28

Factor 26: Estrategia Tecnológica

Definición de factor "Estrategia Tecnológica": *Corresponde a la integración de tecnologías avanzadas para optimizar la producción y reducir impactos ambientales en la organización.*

Pregunta: ¿Cómo se integra la tecnología en la estrategia de la empresa para optimizar procesos y fomentar la innovación?

Marca solo un óvalo.

- Nivel 1: La empresa carece de una estrategia tecnológica definida.
- Nivel 2: La estrategia tecnológica está limitada a proyectos específicos sin integración general.
- Nivel 3: Existe un plan estratégico tecnológico parcial que incluye objetivos a mediano plazo.
- Nivel 4: La estrategia tecnológica está alineada con los objetivos de la organización y cuenta con recursos definidos.
- Nivel 5: La estrategia tecnológica impulsa la innovación sostenible y está integrada en toda la organización.

29

Factor 27: Compras Sostenibles en la Cadena de Suministro

Definición de factor "Compras Sostenibles en la Cadena de Suministro": *Hace referencia a las estrategias de adquisición y gestión logística basada en criterios ambientales, sociales y económicos para reducir impactos negativos en la cadena de suministro y mejorar la competitividad sostenible.*

Pregunta: ¿Qué tan integrada está la sostenibilidad en los procesos de compras y gestión de proveedores?

Marca solo un óvalo.

- Nivel 1: No se consideran criterios ambientales, sociales o económicos en las compras ni en la gestión de la cadena de suministro.
- Nivel 2: Se han identificado algunos criterios de sostenibilidad, pero su aplicación es limitada y no hay una estrategia clara.
- Nivel 3: Se aplican criterios de sostenibilidad en la selección de proveedores y adquisición de materiales, con seguimiento inicial.
- Nivel 4: Existen políticas y métricas de sostenibilidad para optimizar la cadena de suministro, involucrando a los proveedores en la innovación sostenible.
- Nivel 5: La sostenibilidad está completamente integrada en la cadena de suministro, con modelos de abastecimiento innovadores y alianzas estratégicas para la innovación sostenible.

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A.3 Example of Rapport sent to the Companies

Tech Tra PlastiCE

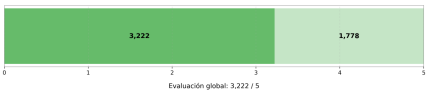
Informe de evaluación – Alimentos Polar Colombia

Autores: Matias Astudillo, Aquileo Piracoa, Sandra Bautista, Paulo Narváez, Pavlo Santander, Daniel Gálvez

Fecha: 13/10/2025

Tech Tra PlastiCE

Evaluación Global: 3.22



La empresa integra progresivamente la innovación sostenible en su estrategia y ha logrado cierto equilibrio entre prácticas organizacionales, procesos, capital humano y vinculación externa. Sin embargo, aún existen brechas en la articulación completa de los pilares. En este perfil, la organización tiene la capacidad de aplicar prácticas de innovación sostenible de forma consistente, aunque todavía requiere reforzar mecanismos de monitoreo, coordinación interna y expansión hacia toda la cadena de valor. La recomendación es profundizar en metodologías avanzadas y consolidar una cultura organizacional orientada a la sostenibilidad.

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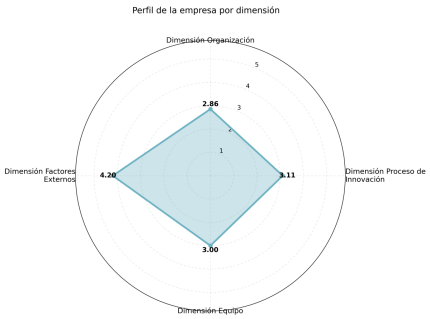
Tech Tra PlastiCE

Perfil de la empresa por dimensión



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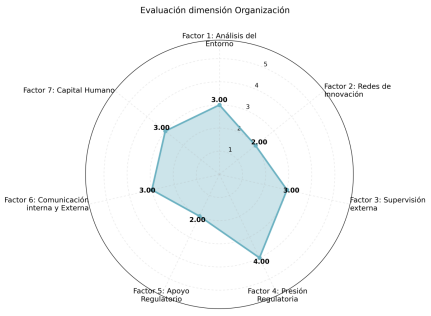
Tech Tra PlastiCE

Evaluación Dimensión Organización: 2.86

Existen esfuerzos iniciales en áreas aisladas, pero aún sin integración estratégica. Para avanzar, la empresa puede alinear sus diferentes áreas de gestión bajo una visión común. El desafío es pasar de acciones aisladas a un modelo organizacional integrado.



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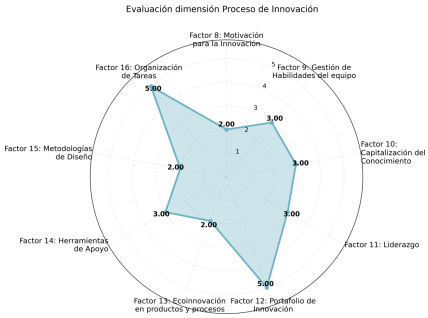
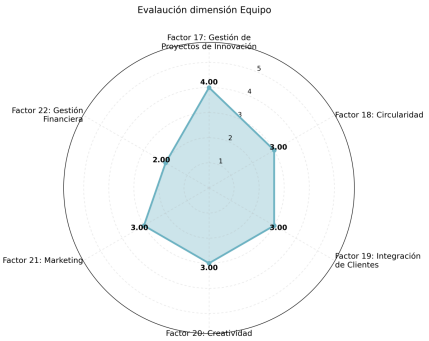
Evaluación Dimensión Proceso de Innovación: 3.11

La gestión de proyectos y metodologías de diseño se aplica regularmente. Se empieza a consolidar una integración progresiva de circularidad. La recomendación es profundizar en herramientas avanzadas y generar sinergias entre proyectos. En este nivel, la empresa puede posicionarse como referente al mostrar resultados cuantificables de reducción de impactos.



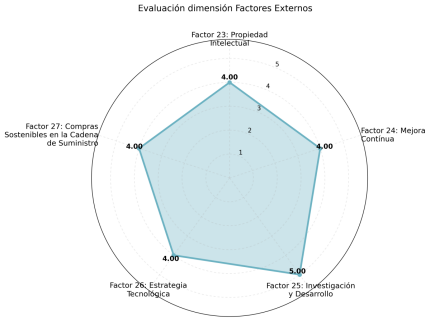
Evaluación Dimensión Equipo: 3.00

El capital humano está alineado con los objetivos de innovación. La empresa puede fortalecer la capacitación en los mandos medios, fomentar la colaboración entre áreas y generar mecanismos de reconocimiento para equipos innovadores.

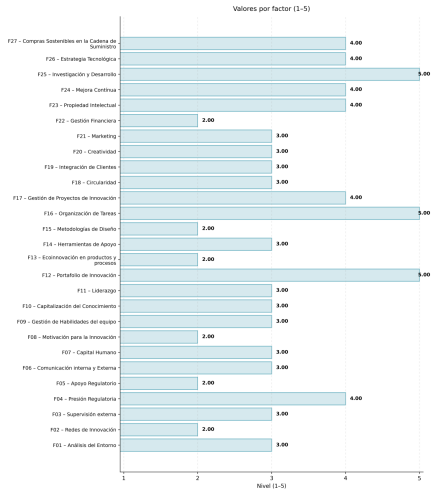


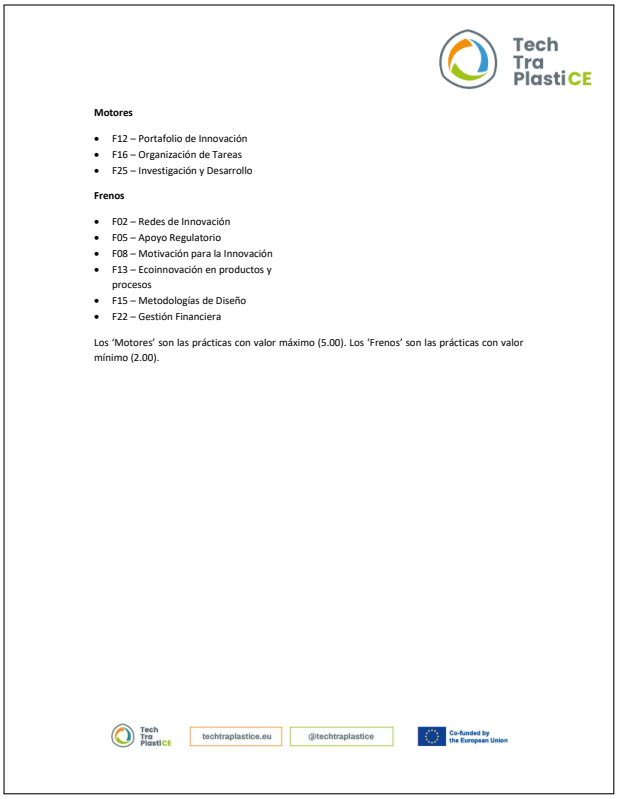
Evaluación Dimensión Factores Externos: 4.20

La institución lidera en su interacción con el entorno: aprovecha regulaciones como oportunidades, participa activamente en redes y utiliza un enfoque predictivo para anticipar cambios. Se recomienda influir en la industria, promoviendo estándares, participando en proyectos internacionales y contribuyendo a políticas públicas sobre sostenibilidad en plásticos.



Perfil de la empresa por Práctica





Motores

- F12 – Portafolio de Innovación
- F16 – Organización de Tareas
- F25 – Investigación y Desarrollo

Frenos

- F02 – Redes de Innovación
- F05 – Apoyo Regulatorio
- F08 – Motivación para la Innovación
- F13 – Ecoinnovación en productos y procesos
- F15 – Metodologías de Diseño
- F22 – Gestión Financiera

Los 'Motores' son las prácticas con valor máximo (5.00). Los 'Frenos' son las prácticas con valor mínimo (2.00).