

D.1.2 Gap analysis for companies/industries

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 report constitutes the second deliverable of Work Package 1 (WP1) of the TechTraPlastiCE project and provides a comparative analysis of the plastics industry in Argentina, Chile, and Colombia from a circular economy perspective. 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. At the same time, several opportunities are identified in areas such as eco-design, process innovation, green markets, and inclusive business models.

The report concludes that 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.

Introduction

The global plastics industry has grown exponentially over recent decades, becoming a fundamental component of modern economies and daily life. However, this growth has also brought severe environmental challenges and highlighted the urgent need to shift toward more sustainable production and consumption models. In Latin America, the situation is particularly complex, marked by low recycling rates, high levels of informality, and fragmented policy frameworks. In response to these challenges, the *TechTraPlastiCE* project seeks to strengthen the role of higher education institutions in supporting the transition to a circular economy in the plastics sector. The project fosters collaboration between universities, businesses, and key stakeholders to enhance innovation, technology transfer, and inclusive sustainability strategies.

Work Package 1 (WP1) provides a macro-level diagnostic of the plastics industry in three Latin American countries, Argentina, Chile, and Colombia, by identifying structural barriers, enabling conditions, and strategic actors relevant to circularity. This deliverable, D.1.2, builds on the framework developed during the first phase of the project and presents a comparative analysis based on national findings collected through interviews, surveys, industrial visits, and documentary review.

The document explores four core dimensions:

1. the structure of the plastics industry,
2. enabling factors and key stakeholders in the circular transition,
3. opportunities and barriers for companies, and
4. modes of interaction across the value chain.

This deliverable is intended to inform and guide the next work packages of the project,

particularly in identifying pilot strategies, capacity-building activities, and inclusive innovation models for circularity in the plastics sector.

Methodology

To guide the development of this deliverable, a structured methodology was designed and implemented by the project team. The approach aimed to ensure consistency across countries, while allowing the flexibility needed to capture national specificities. The process involved multiple phases, from the creation of a shared analytical tool to the consolidation and comparative interpretation of findings. The Figure 3.1 illustrates the key steps that shaped the methodological pathway:

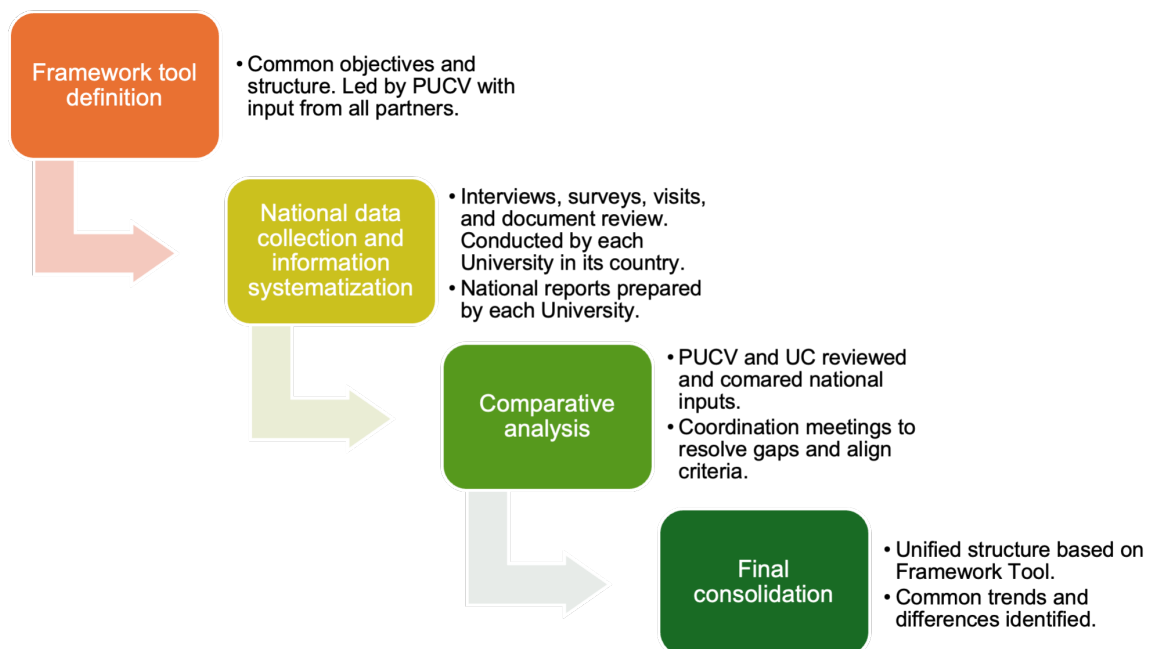


Figure 2.1: Methodological approach

The methodology applied in this stage of the project was developed based on the Framework Tool designed in the initial phase. This tool established the objectives, key questions, and common structure to guide the collection of information in each country.

Universities from the consortium collected data through interviews, surveys, industrial visits, and a review of secondary sources available at the national level. The interviews and surveys were aimed at companies and organizations belonging to different links within the plastic value chain, including raw material producers, processors, marketers, waste managers, recyclers or waste pickers, and waste valorization companies.

Each University organized and systematized the information collected in its country, generating national inputs that were delivered to the project's central team. Subsequently, teams from the Pontificia Universidad Católica de Valparaíso (PUCV) and the Universidad Central collaborated to carry out a comparative analysis of the information, identifying similarities, differences, and common trends.

To this end, coordination meetings were conducted before and after the submission of national reports. This facilitated the identification of methodological challenges, unresolved issues detected during the process, and the need to reach consensus on analysis criteria.

Finally, the deliverable was drafted by consolidating the national results, organized according to the sections established in the Framework Tool, and then conducting a comparative analysis, highlighting the main points in common and the differences identified between the three participating countries.

As supporting material, the annexes contain the full documentation submitted by each University. Country-specific data collection process, institutional contributions, and the complete set of survey responses and interview summaries conducted with actors along the plastic value chain, is included.

3.1 Plastic Industry

The plastics industry is one of the main strategic sectors of the global economy. It has experienced significant expansion in recent decades, driven by growing demand in sectors as diverse as food, construction, automotive, agriculture, healthcare, and electronics. Currently, plastics are used in countless industrial and everyday processes due to their versatility, low cost, durability, and adaptability to multiple applications.

Figure 3.1 presents global plastic production from 2020 and its projection through 2060. In this sense, from a global production of just 2 million tons in 1950, output rose to 435 million tons in 2020, and is projected to reach over 1,300 million tons annually by 2060 if no further policy action is taken ([Economic Co-operation and Development, 2022](#); ?; ?).

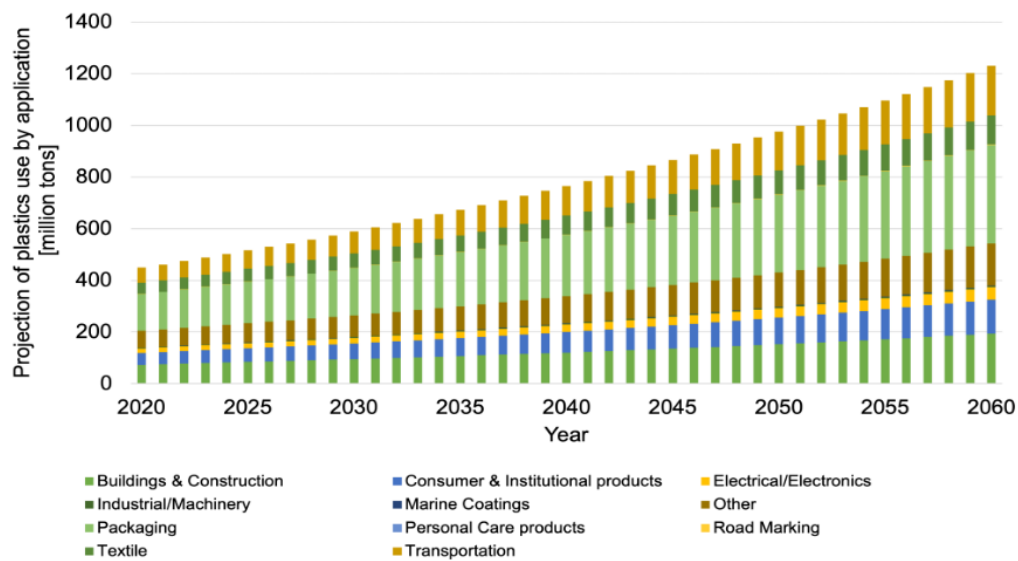


Figure 3.1: Projection of plastics use by application 2020-2060 (OECD, 2024)

This exponential growth in production has led to a corresponding increase in waste. In the last 20 years, global plastic waste generation has doubled from 180 million tons to over 350 million tons per year, and is expected to nearly triple by 2060. Despite growing awareness, less than 20% of plastic waste is currently recycled, while around 50% is still landfilled, particularly in developing regions where infrastructure and policy frameworks remain limited. The remaining 30% is either incinerated or leaked into the environment, contributing to greenhouse gas emissions, air pollution, and ecosystem degradation. In Latin America and the Caribbean, recycling rates are especially low, often below 10%, and informal recycling remains widespread, with high environmental and social costs ([Economic Co-operation and Development, 2022](#); ?).

Latin America, like other emerging regions, faces particular challenges in adapting to this global dynamic. Recycling rates remain low, regulatory frameworks are fragmented, and informal recycling continues to play a major role in plastic recovery. These factors hinder progress toward more sustainable models and highlight the importance of coordinated efforts among public institutions, private actors, and civil society. In this context, it is essential to understand how these global trends and the associated challenges influence the plastics industry at the national level. The following sections detail the situation in Argentina, Chile, and Colombia, analyzing their industrial structure, main applications, stakeholders, and segments with the greatest potential for advancing toward more sustainable models.

3.1.1 Characterization of the plastics industry in Argentina, Chile, and Colombia

The plastics sector is a key industry in the economies of Argentina, Chile, and Colombia. This fact is because of both, its cross-cutting nature in multiple production chains and its potential for transformation towards a more sustainable model.

In all three countries, the plastics industry involves diverse actors ranging from the production and processing of raw materials to recycling and waste management, as it is described in Figure 3.2. Additionally, it is important to highlight, that plastic industry represent an important generator of direct and indirect employment.

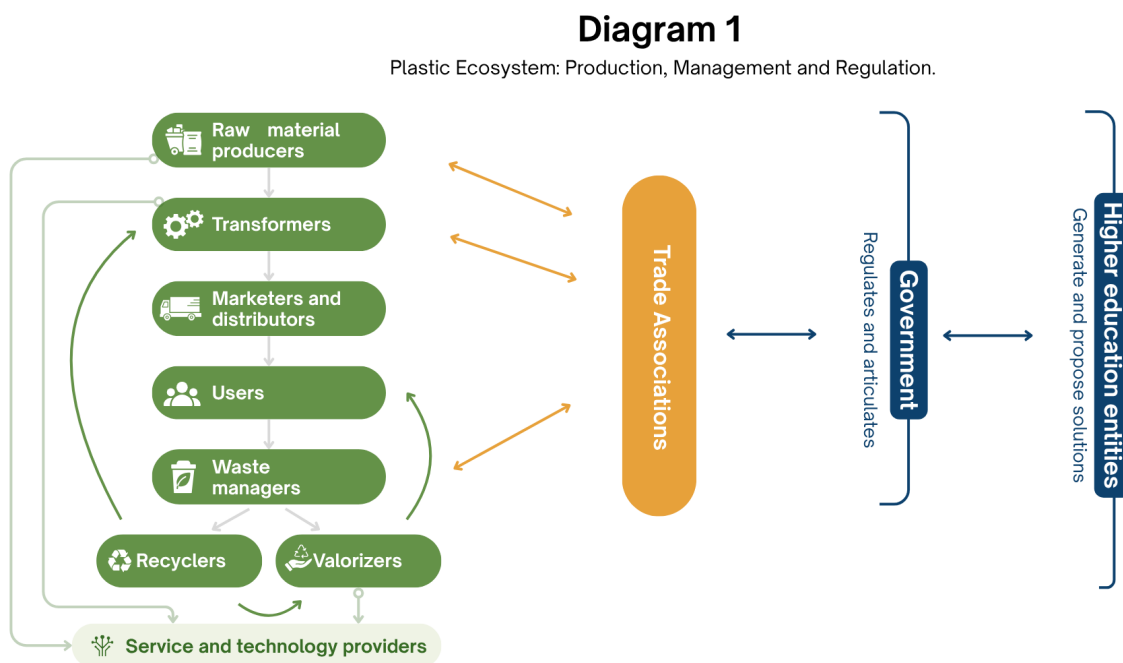


Figure 3.2: Plastic Ecosystem: production, management and regulation.

Particularly in Argentina, this industry has approximately 2,800 manufacturing companies, more than 300 recovery companies, and a universe of at least 150,000 urban waste pickers who play a key role in the collection of recyclable materials, especially plastics. This structure combines medium-sized national companies, multinational firms, small family businesses, and cooperatives, covering the entire value chain: from raw material production to recycling and waste management. The main polymers covered by this industry are polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), polyethylene terephthalate (PET), and

polystyrene (PS). These materials are used mainly in packaging (almost half of consumption), but also in construction, agriculture, automotive, and electronics. Despite the sector's potential, Argentina faces challenges marked by high logistics costs, international market fluctuations, regulatory fragmentation, and the absence of a national law for Extended Producer Responsibility (EPR).

Regarding Chile, the industry shares a strong focus on packaging (around 50% of consumption), followed by construction, mining, agriculture, fishing, and retail, with plastics also being used in long-life applications. Unlike Argentina and Colombia, Chile does not produce virgin polymers and is totally dependent on imports. The sector includes some 520 companies, with a small group (28%) accounting for more than 80% of direct employment, reflecting a high industrial concentration. Although it has made notable regulatory progress, such as the EPR Law and the Roadmap for a Circular Country by 2040, Chile faces limitations in infrastructure and environmental education, recycling only 7% of plastic waste, while 89% ends up in landfills and the remaining 4% is lost in the ecosystem.

In Colombia, the plastics industry contributes about 2.9% to manufacturing Gross Domestic Product (GDP) and is notable for its highly fragmented structure: almost 68% of companies are micro-enterprises, followed by small and medium-sized enterprises. While only 1.8% are large players such as Esenttia S.A.¹, Mexichem Resinas Colombia S.A.S.², and Ajoever Darnel S.A.S.³. Unlike Chile, Colombia produces polymers such as PE and PP locally, which strengthens its integrated value chain.

The products are mainly used in packaging, construction, agriculture, and the automotive industry. Although it faces similar challenges, such as low recycling rates, regulatory pressure, and limitations on innovation, it has shown recent progress with initiatives such as Law 2232 of 2022 and the National Circular Economy Strategy (ENEC), along with growing investment in recycling capacity.

3.1.2 Geographic distribution of the industry

In the analyzed countries, the plastics industry is highly concentrated in certain regions, as it is possible to observe in Figure 3.3, where the main industrial, logistics, and consumption hubs are located.

In Argentina, the industry is concentrated in the Buenos Aires Metropolitan Area (AMBA),

¹ See <https://www.esenttia.co/home-clientes/>

² See <https://www.vestolit.com/about-us-2/region-sites/colombia-offices-and-tarifs/>

³ See <https://www.vestolit.com/about-us-2/region-sites/colombia-offices-and-tarifs/>

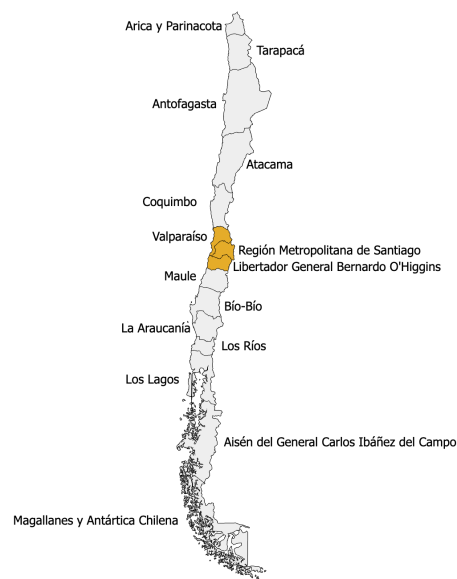
Córdoba, Santa Fe, and Mendoza. Recycling and recovery companies, on the other hand, are more widely distributed across at least 19 provinces thanks to initiatives such as the Federal Recycling Map.

In Chile, 88% of companies in the sector are located in the central macrozone (Valparaíso, Metropolitan, and O'Higgins regions), benefiting from their proximity to consumption centers and logistics infrastructure.

In Colombia, the industry is concentrated in Bogotá and Cundinamarca (52.1% of companies), followed by Antioquia (24%) and Valle del Cauca, which are the country's main industrial and logistics hubs.



(a) Argentina



(b) Chile



(c) Colombia

Figure 3.3: Geographical distribution of the plastics industry in Argentina (A), Chile (B), and Colombia (C), based on the main areas of industrial activity. Darker shades indicate regions with a higher presence of activities related to the plastics industry, based on national sources.

3.1.3 Products with the greatest national relevance

In all three countries, the polymers with the greatest relevance in the domestic market are PE, in its high-density (HDPE) and low-density (LDPE) variants, PP, PVC, PET, and PS. These materials lead both local production and consumption and form the basis of most processed products.

- In Argentina, the market is dominated by HDPE, LDPE, PP, PVC, and PET, which are also the plastics with the highest recovery and recycling rates.
- In Chile, the consumption of PE, PP, PVC, PET, and PS is the basis for the manufacture of products for key sectors, although all raw materials are imported.
- In Colombia, PP and PVC stand out, followed by PS, PE, and other polyolefin resins. PET, although it is consumed in large quantities, is mostly imported.

3.1.4 Main applications of plastic products

The main applications of plastic products in Argentina, Chile, and Colombia reflect similar patterns, centered on five major sectors described in Figure 5.

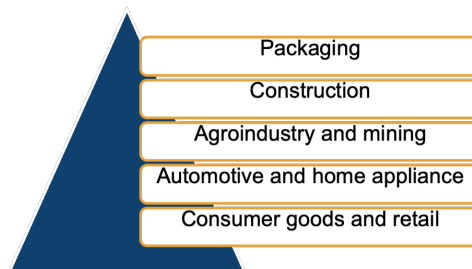


Figure 3.4: Main sectors according to plastic use

The **packaging** segment leads consumption in all three countries, accounting for between 45% and 50% of the total.

It includes bags, films, bottles, jars, drums, boxes, sacks, and maxi sacks, used in food, beverages, pharmaceuticals, personal care, toiletries, cosmetics, meet protection, preservation, and transport needs.

The second most important sector is construction, where PVC pipes, profiles, insulation, coatings, and structural components stand out, valued for their durability, lightness, and corrosion resistance, which are essential in infrastructure and housing.

Agroindustry and mining rank third, with applications such as irrigation systems, mesh, greenhouses, silo bags, mulching, and containers, which optimize resources and ensure efficiency in agricultural and mining operations.

The **automotive and household appliance** sectors are also significant, using plastics to manufacture parts, housings, insulation, and safety components, taking advantage of their benefits to reduce weight, facilitate assembly, and improve design.

Finally, **consumer goods and retail**, along with household items, health, sports, fishing, and emerging technologies (such as 3D printing), complete the range of applications, demonstrating the versatility of plastics in everyday life and in innovative sectors.

3.1.5 Segments with the greatest potential for adopting circular economy models

In Argentina, Chile, and Colombia, the segments of plastics production chain with the greatest potential for adopting circular economy models. They are those where it is possible to maximize the recovery, reuse, and valorization of materials, minimize the use of virgin resources and waste generation. Based on a comparative analysis of experiences, installed capacities, and opportunities identified in the three countries, five major areas for intervention stand out.

The first key segment is **waste management, recycling and valorization industry**, as it has the greatest immediate potential in all three countries; where waste managers, recyclers or waste pickers, recyclers and valorization companies are directly involved.

- In Argentina, this area requires substantial improvements in infrastructure, source-separated collection, and advanced recycling, both in formal circuits and in the integration of urban waste pickers.
- In Chile, managers and recyclers or waste pickers already handle more than 100,000 tons per year, with expanding installed capacity, but with the challenge of decentralizing operations to regions outside the central zone.
- In Colombia, strengthening recycling infrastructure, formalizing and training professional waste pickers, and incorporating advanced technologies are fundamental aspects for promoting circularity and increasing the recovery of materials.

The second relevant segment is **product transformation and manufacturing**, which includes processing companies. Noteworthy initiatives in this area include the incorporation of recycled materials, eco-design, innovation with bioplastics, and reduction in the use of virgin polymers.

- In Argentina, there is strong potential for progress in eco-design and the inclusion of recycled materials, as well as in the development of bioplastics and biodegradable materials.
- Chile and Colombia also show opportunity due to their incentives and innovative capacity to redesign packaging, create reusable products, and facilitate the closure of production cycles.

The **production of primary and secondary raw materials** is a third strategic focus, linked to raw material producers and processors who adopt these solutions. This includes the production of recycled or bio-based resins⁴ that can complement virgin polymers, as well as research into new materials.

- In Argentina and Colombia, developing capacities to produce recycled or bio-based resins represents a significant challenge with high potential impact for transforming the industry.
- On the other hand, in Chile, although there are recycling initiatives and regulatory advances that encourage the incorporation of recycled material in final products, the production of plastic resins is not a local activity and depends entirely on imports.

The **consumption, distribution, and post-consumption** stage, which involves marketers, distributors, and users, also plays a central role. Promoting responsible consumption, encouraging reuse, and developing circular business models, such as refill, return, and leasing systems, allows the generation of material returns and strengthens circularity. Initiatives such as deposit-refund systems, reverse logistics programs, and education and awareness campaigns have a particular impact in this segment.

In summary, the segments with the greatest potential for adopting circular economy models in the plastics industry in Argentina, Chile, and Colombia are: (1) waste management and recycling; (2) product transformation and manufacturing, with a focus on incorporating recycled materials and eco-design processes; (3) the production of secondary raw materials, such as recycled or bio-based resins; and (4) the consumption, distribution, and post-consumption stage, through the promotion of reuse and circular models.

Strengthening these segments, together with coordination between public, private, and social actors, may be key to moving toward a more efficient and sustainable plastics industry.

⁴Bio-based material is material that is manufactured from raw materials of biological origin instead of fossil raw materials. Some examples include biopolyethylene (PE) made from sugar cane and polyhydroxyalkanoates (PHA) generated by bacteria from organic waste.

3.2 Key factors and actors in the transition to the Circular

The transition to a circular economy in Latin America, particularly in the plastics sector, faces multiple structural challenges that go beyond the implementation of isolated technologies or regulatory frameworks. The Circularity Gap Report 2025 ([Economy and Deloitte, 2025](#); [Programme et al., 2023](#)) and its regional edition for Latin America and the Caribbean highlight the magnitude of the problem: the global circularity index has fallen from 7.2% in 2018 to 6.9% in 2021, and in our region the situation is even more critical, with rates below 1%.

One of the main global gaps identified in the CGR 2025 is the absence of concrete material targets. While carbon and biodiversity have binding international frameworks, the use of materials, such as plastic, remains in a gray area, with no global targets or clear governance mechanisms. At the regional level, this weakness translates into the institutional fragmentation that characterizes Latin America. Circular Economy policies exist, but they are scattered, sectoral, and poorly coordinated, which limits their effectiveness. Colombia, for example, has advanced regulations on solid waste and packaging, but their implementation is uneven. Argentina has promoted local recovery strategies without a clear national policy. Chile, for its part, has made more structured legislative progress (such as the EPR Law), although it faces challenges in its implementation and in the inclusion of non-business actors.

A critical issue is the informality of recycling, particularly in Colombia and Argentina. Up to two-thirds of waste in Latin America is neither registered nor tracked, which perpetuates social inequalities, lowers the quality of secondary materials, and deepens the exclusion of grassroots recyclers or waste pickers. Their lack of formal integration into the value chain restricts access to technology, financing, and capacity-building programs.

In this context, the situation of plastic recycling in the three countries reflects both the gaps and the opportunities for a deeper transition. The enabling infrastructure for technical recycling is just beginning; the rate of use of secondary inputs in the region is barely 1%. Meanwhile, materials continue to accumulate in long-life infrastructure with no clear plans for future dismantling, and plastic waste continues to be managed largely by informal circuits.

Beyond these limitations, it is possible to recognize complementary strengths among the three countries. Chile has built a regulatory framework that can serve as a regional example, while Colombia has significant scientific capabilities in life cycle analysis and eco-design. Argentina, additionally to its scientific know-how, has a rich experience of public organization around recycling, with different organizations and associations that could be strategic allies in inclusive innovation processes.

Summarizing, circularity in the plastic sector cannot be thought as a simple technical improvement to existing processes. It involves rethinking the economic model, rebuilding relationships between actors, democratizing technology, and redesigning public policies from a systemic and territorial perspective. For Colombia, Argentina, and Chile to move toward this horizon, it is necessary to go beyond regulatory compliance and commit to a structural transformation that articulates scientific knowledge, social justice, and actual sustainable transition.

3.2.1 Opportunities to promote the circular economy in the plastics sector

The plastic sector in Argentina, Chile, and Colombia shows opportunities to promote the circular economy associated with: the public policy and regulatory context, recycling and waste management systems, eco-design, process innovations, green markets, responsible consumption, and collaboration between actors. Each of these are described below, contrasting the similarities and differences between Argentina, Chile, and Colombia.

3.2.1.1 a) Public policy and regulatory context

Chile and Colombia have made significant progress on the issues of Extended Producer Responsibility and single-use plastics, while Argentina lacks a national framework to coordinate the specific efforts that some regions have made in these areas.

The adoption of these regulatory frameworks in the three countries creates opportunities for coordination between actors in the productive sector, academia, and government for the socialization, understanding, and implementation of the actions required for compliance.

3.2.1.2 b) Recycling and waste management systems

The three countries share challenges regarding poor infrastructure and systems for adequate waste management that guarantee process efficiency and material quality.

In this regard, one opportunity is the implementation of technologies to support waste collection and sorting. For Argentina, this is the area of intervention with the greatest potential for the transition to a circular economy in plastic, with an emphasis on on-site sorting and the decentralization of recycling centers.

In the case of Chile, the Roadmap for a Circular Chile by 2040 sets targets to increase the recycling rate from 4% (2021) to 65% (2040). However, it has been identified that the lack

of infrastructure in that country hinders compliance with legislation promoting the circular economy. An opportunity to promote waste management actions is provided by packaging return systems based on reverse logistics models, which involve actors throughout the plastic value chain and promote new business models.

For Colombia, the reuse and recycling of plastics is also a priority, as established in the goals of the National Plan for the Sustainable Management of Single-Use Plastics ([Ambiente y Desarrollo Sostenible, 2021](#)).

The policy and regulatory context in that country has created opportunities for the expansion of plastic waste management infrastructure, but challenges remain due to the lack of collection and sorting centers in rural areas.

3.2.1.3 c) Ecodesign

Opportunities for innovation based on ecodesign have been identified in all three countries, driven by the regulatory framework in Chile and Colombia. This includes design based on recyclability and reuse criteria, the use of biodegradable or compostable products, and material minimization in products design.

3.2.1.4 d) Process innovations

There are common opportunities in Argentina, Chile, and Colombia to generate process innovations associated with chemical recycling, automated quality control, and advanced material separation.

In Colombia, the importance of implementing digital platforms to achieve waste traceability and improve waste management is also highlighted.

3.2.1.5 e) Green markets

In all three countries, opportunities have been identified associated with the growth of markets for recycled products, job creation in areas such as recycling, eco-design, and waste management, and green certification and labeling.

Fiscal and economic incentives for the circular transition have also been promoted, but they need to be adapted to the needs of small and medium-sized enterprises.

3.2.1.6 f) Responsible consumption - Consumer education and awareness

This is an area of opportunity in all three countries, involving actions to raise public awareness, encourage waste separation, and promote circular economy practices. Chile highlights the role of educational institutions in these areas of intervention.

3.2.1.7 g) Collaboration between actors

Multisectoral collaboration and collaborative business models are identified as opportunities to promote the circular economy of plastics in the three countries. These are enablers of the opportunities mentioned above.

3.2.2 Weaknesses or barriers faced by local companies in the transition to the circular economy

The analysis of the weaknesses or barriers faced by companies in the plastics sector in Argentina, Chile, and Colombia in their transition to the circular economy was based on the multidimensional approach to sustainability TBL+ (Triple Bottom Line extended) proposed by Bautista et al. (2016). From this perspective, the traditional notion of sustainability (economic, social, and environmental) is integrated with political-legal, technological, and sociocultural dimensions.

The analysis carried out for Colombia by Avendaño (2025) is used as a starting point, and each dimension is contrasted with the weaknesses or barriers identified for Argentina and Chile.

The results of the comparison for the three countries are presented in Table 3.1.

Table 3.1: Barriers identified by dimension for Argentina, Chile, and Colombia

Dimension	Main barriers	Ar- gentina	Chile	Colom- bia
Economic - Financial and market factors	High dependence on imported raw materials		X	X
	Uncompetitive recycling costs	X	X	X
	Sale price of recycled product vs. virgin material	X	X	X
	Difficulties in accessing finance (especially micro, small and medium-sized enterprises (MSMEs))		X	X
	Inadequate tax incentives or incentives not tailored to different types of businesses	X	X	X
	Territorial asymmetries in the distribution of demand for recovered plastic materials	X		
Technological	Limited capacity of companies in research, development, and innovation, especially MSMEs			X
	Poor recycling infrastructure	X	X	X
	Technological gap between MSMEs and large companies			X
	Weak adoption of eco-design			X
	Difficulty in obtaining post-consumer plastic waste	X	X	X
	Few initiatives to convert production	X		
	Absence of regulations for the implementation of differentiated collection schemes	X		
	Absence of national legislation to promote the circular economy	X		
	Fragmented regulations and weak implementation			X
	Lack of inter-institutional harmonization	X		X

Environmental	Slow procedures		X	X
	Exclusion of informal recyclers or waste pickers	X	X	X
	Low recycling rate	X	X	X
	High waste generation			X
	Insufficient infrastructure for waste management	X	X	X
	Limited scope for local governments to invest in waste management infrastructure	X	X	
	Critical environmental impact of non-recovered waste	X		X
	Low level of environmental awareness and myths	X	X	X
	Weak citizen participation	X	X	X
	Stigmatization of informal recycling and social exclusion of recyclers or waste pickers	X	X	X
Sociocultural	Poor business training in circular economy	X	X	X
	Perception of low quality of recycled products	X	X	X

3.2.3 Key actors to drive the circular economy in the plastics sector

The transition to a circular economy in Latin America faces structural, regulatory, technological, and cultural challenges. In the case of the plastic sector, this transition depends largely on the ability of heterogeneous actors throughout the value chain to coordinate their efforts.

A comparative analysis of national studies from the TechTraPlastiCE project (Argentina, Chile, and Colombia) reveals the presence of five key categories of actors, whose specific weight, level of formalization, technical capabilities, and degree of interaction vary between countries. This diversity creates both barriers and opportunities for advancing toward collaborative and territorially adapted governance of circularity.

3.2.3.1 a) Manufacturing industry

In all three countries, the plastics industry has a dual structure: large companies with high technological and economic concentration (especially in Chile), and a broad network of small and medium-sized enterprises (SMEs) with limited capacity to adopt circular practices.

In Argentina, family-owned SMEs predominate (some 2,750 firms involving 56,000 direct workers). In Chile, 28% of companies generate 82% of the sector's employment, evidence of strong industrial concentration. In Colombia, although there are no equivalent precise figures, industrial weight is concentrated in three departments (Cundinamarca, Antioquia and Valle del Cauca).

Despite growing regulatory, social, and market incentives toward circularity, the industry still faces significant barriers: poor collection and sorting infrastructure, underdeveloped markets for recycled materials, and unfair competition from virgin materials, which are often subsidized or imported at lower costs.

3.2.4 b) Formal and informal recyclers

Recyclers or waste pickers play a structural role in closing material cycles, especially as suppliers of secondary raw materials. In Argentina, there are an estimated 150,000 urban waste pickers, of whom only 18,000 are organized in cooperatives. The Argentine Federation of Cartoneros, Carreros and Urban Recyclers (FACCYR) is an important socio-political actor, although it operates in highly informal conditions. It is important to highlight that these groups of waste pickers not only collect plastic waste but also paper, glass, board, among others. In some cases, plastic is not all of them recover plastics.

In Colombia, the formalization of waste pickers has been state policy since Decree 596 of 2016, which has promoted the organization of more than 60,000 waste pickers into cooperatives. However, these actors remain invisible in formal systems and face technical, contractual, and sociocultural barriers to being recognized as economic agents.

Chile legally recognizes “public recyclers” in the EPR Law, but their effective integration into value chains is still low. Organizations such as ASIPLA and AB Chile have taken on a growing role in sectoral coordination and technical capacity building.

In all three countries, recyclers or waste pickers face structural conditions of precariousness, low technification, weak interaction with industry, and limited institutional recognition. Nevertheless, they are essential in the circularity of plastics, and their effective inclusion is a *sine qua non* for a just transition.

3.2.4.1 c) National and local governments

The state plays a decisive role as an enabler, or inhibitor, of the circular economy, depending on its regulatory, enforcement, promotion, and territorial intervention capacities.

Chile is the most advanced country in terms of regulatory consistency: the EPR Law, the Single-Use Plastics Law, and the Circular Economy Roadmap to 2040 constitute a systemic framework with binding targets and a multisectoral approach.

Colombia has a robust regulatory framework, Law 2232 of 2022, the National Circular Economy Strategy (ENEC 2019) and Resolutions 1407, 2184 and 0803, but faces significant challenges related with institutional fragmentation, uneven implementation and low compliance at the subnational level.

In Argentina, the legal framework is more limited and waste management depends heavily on municipalities, which leads to great heterogeneity in capacities, priorities, and approaches.

In all cases, multilevel coordination remains weak, and the implementation of circular policies requires greater vertical and horizontal coordination mechanisms.

3.2.4.2 d) Academia and R&D and Innovation Center

Universities and research centers have strategic potential to boost technological innovation, circular design, new materials development, life cycle analysis (LCA), and the generation of circularity metrics. However, their role as active players in the circular economy is still at an early stage.

In Chile, there are examples of university-industry relationships, such as Natural Plas with the University of Concepción, although these remain sporadic and are not part of a broader, systematic policy of technology transfer or multisectoral governance. In Argentina, institutions such as PLAPIQUI at the National University of the South (UNS) demonstrate links with industry and recyclers, while the National University of Río Negro (UNRN) has engaged with social organizations. Nevertheless, the articulation remains limited and funding for applied research projects continues to be insufficient. In Colombia, the connection between academia and both industry and grassroots recyclers is still weak and lacks coordination mechanisms.

3.2.4.3 e) Intermediary organizations and trade associations

Trade associations and intermediary platforms play a key role as catalysts for public-private coordination, technical training, and the generation of sectoral information.

In Chile, ASIPLA and AB Chile lead coordination and technical support processes. In Colombia, Acoplásticos plays an active role in the production of sectoral knowledge, although with limited territorial penetration. In Argentina, the Cámara Argentina de la Industria Plástica (CAIP), the Cámara de la Industria de Reciclados Plásticos (CAIRPLAS) and ECOPLAS, have significant institutional representation and promotes plastic circularity through different initiatives among its partners. Moreover, Fundación Banco de Plásticos is a small growing nonprofit organization who is gaining recognition within the market of plastic credits.

This tool contributes to plastic circularity and to the interaction between companies and recyclers. These organizations have significant potential as intermediaries between public policy, industry, and science. However, their capacity for influence is conditioned by the existence of coherent regulatory ecosystems and a shared long-term vision.

3.2.5 Interaction between actors and factors influencing the circular economy

The dynamics of interaction between key actors in the circular economy of plastics in Argentina, Chile, and Colombia are determined by a combination of structural, regulatory, cultural, and technological factors.

Although there are important similarities in the challenges faced by these countries, such as informal recycling, low value of recycled plastic, and institutional fragmentation, there are also substantial differences in the nature and depth of interactions. These differences directly influence the effectiveness and scalability of circular strategies.

3.2.5.1 1. Structural factors influencing the circular economy

Technological and innovation factors: In Chile, relevant technological capabilities have been identified, especially in mechanical recycling and recyclable product design. The Roadmap to 2040 sets concrete targets for investment in circular technology and university-business collaboration. In Colombia, incipient developments in chemical recycling, bioplastics, and eco-design are led by universities and research centers, but face limited industrial scaling capacity and a disconnect with recyclers or waste pickers. In Argentina, despite a historically strong manufacturing industry, technology adoption for circularity is low and restricted to certain exporting firms.

In terms of data availability, traceability, and enabling technologies, the absence of integrated information systems hinders waste traceability, impact measurement, and evidence-based decision-making. While there are some advances (such as digital platforms in Chile and official registries in Colombia), systems are still in their infancy and are not interoperable between actors.

Economic factors: All three countries face a cost structure that discourages the use of recycled materials: low prices for virgin materials, unstable markets for recycled materials, poor traceability, and unfair competition in certain segments. In Chile, some sectors have found added value in circularity as a competitive advantage (mining, retail). Colombia has tax and investment incentives (free trade zones, seed capital), but with low access for SMEs. Argentina has no structural incentives, and informality predominates in materials recycling.

Formalization and inclusion of recyclers or waste pickers: The effective inclusion of waste pickers, especially those organized in cooperatives, is key to a fair circular economy. Colombia has taken important steps through Decree 596 of 2016, although persistent operational challenges remain. In Chile, the inclusion of waste pickers in the EPR Law has not yet translated into functional integration within value chains. In Argentina, recognition and institutional coordination with waste pickers depend on local initiatives and the advocacy capacity of social movements such as Argentine Federation of Carreros, Cartoneros, and Urban Recyclers (FACCYR).

Regulatory coherence and multisectoral governance: The existence of clear, binding regulatory frameworks with a systemic approach allows for the coordination of actions between producers, recyclers or waste pickers, consumers, and public entities. In this regard, Chile is in a more advanced position thanks to the EPR Law, the Single-Use Plastics Law, enforcement instruments, participation mechanisms, and the Circular Economy Roadmap to

2040. Colombia, on the other hand, has an advanced but scattered set of regulations, which reduces their effectiveness. In addition, their implementation across the country is uneven, creating gaps in the access to infrastructure and management services. Argentina has more fragmented regulatory frameworks, with responsibilities scattered across different levels of government and little inter-institutional coordination.

University-industry-recycler interaction: Coordination between universities, industry, and grassroots recyclers is the key for moving toward inclusive circular models. In Chile, concrete experiences of open innovation, technology networks, and the integration of recyclers or waste pickers into reverse logistics systems have been developed. In Colombia, links between academia and industry are still weak, especially with waste pickers, who do not have access to technology or technical training. In Argentina, the interaction between academia, industry, and recyclers shows varying levels of development. While some institutions have limited engagement, others, such as PLAPIQUI at National University of the South (UNS) and National University of Río Negro (UNRN), demonstrate strong ties to the industrial and social dimensions of recycling. These experiences reflect a growing but still uneven articulation across the country.

3.2.5.2 2. Types of interaction in the three countries

Chile: The country has relatively structured interaction, driven by a robust legal framework that requires producers and managers to coordinate. Companies have responded through consortia, strategic alliances, and the adoption of technologies, partly thanks to regulatory incentives. The existence of sectoral roadmaps makes it possible to plan long-term collaborations, although challenges remain in the territorialization of these policies and the effective inclusion of grassroots recyclers.

Colombia: Interaction is more fragmented and dependent on voluntary alliances or pilot projects. Although there is a National Circular Economy Strategy, its implementation depends on the institutional capacity of the regions. Some business sectors (e.g., ACOPLÁSTICOS) have promoted good practices, but coordination with waste pickers and local governments remains uneven. Multi-stakeholder platforms exist, such as the National Alliance for the Circular Economy, although they have limited binding power.

Argentina: A grassroots approach to interaction prevails, driven by the movement of waste pickers and cooperatives. While this generates valuable territorial practices, the lack of a national coordinating framework limits the consolidation of stable alliances. Interaction between industry, municipalities, and waste pickers occurs in many cases out of necessity

rather than institutional design, which restricts their capacity for systemic transformation.

3.2.6 Relationship between Universities, industry, and plastic recycling

The transition to a circular economy in the plastics sector depends not only on public policies and market dynamics, but also on the development of knowledge, technology, and social innovation. In this context, Universities and research centers play a strategic role as bridges between science, industry, recyclers or waste pickers, and public policy.

These relationships must be analyzed not only in terms of the existence of actors and initiatives, but also in terms of their density, directionality, and capacity to generate structural transformations. The comparative analysis between Argentina, Chile, and Colombia reveals functional similarities, institutional divergences, and possibilities for complementarity that can be exploited within the framework of the TechTraPlastiCE project.

The role of Universities as drivers of the circular transition is potentially strategic, but still marginal in practice. The comparative analysis shows:

- **Chile** is the country with the most progress in terms of university-industry coordination in the context of plastic recycling. There are concrete examples of collaboration, such as Natural Plas with the University of Concepción, which has developed solutions to recover plastic waste that is difficult to recycle. Likewise, some universities participate in regional circular economy hubs and in the design of products with recycled content. This coordination has been favored by public policies aimed at sustainable innovation and the existence of competitive funds that promote technological alliances. However, there is still limited participation by academia in multi-stakeholder governance spaces and little connection with grassroots recyclers.
- **In Colombia**, academia has shown growing participation in the circular economy, mainly through applied research programs, sustainable entrepreneurship initiatives, and training in environmental engineering and related fields. Public and private universities have generated projects aimed at improving recycling processes, designing biodegradable materials, or implementing LCA methodologies. However, the relationship with the plastics industry is still weak and fragmented. There are few stable mechanisms for technology transfer or university-business consortia, and experiences tend to be isolated, lacking scalability and institutional continuity. Links with organized waste pickers are even more incipient, except for isolated experiences with a social focus.
- **In Argentina**, the relationship between academia, waste pickers, and the industrial

sector varies across regions and institutions. While some universities focus on social and environmental aspects of recycling, others, such as PLAPIQUI, play a key role in technological innovation and industry engagement through applied research and technology transfer. In parallel, institutions like UNRN maintain active collaborations with waste picker cooperatives and local governments, contributing to inclusive waste management strategies. Although national R&D&I policies focused on circular economy remain limited, these university-led initiatives show significant potential to strengthen connections with the productive sector.

In all three countries, universities play a potentially key role in research, capacity building, and technology transfer. All of them have capabilities in materials engineering, life cycle analysis (LCA), eco-design, and recycling technologies. While the level of engagement varies by institution and region, some universities have established collaborations with grassroots recyclers and local governments. However, in many cases, these connections remain isolated rather than institutionalized, limiting the broader impact and inclusiveness of circular strategies. Strengthening these links is essential to ensure the co-creation of solutions and the effective implementation of circular economy models.

Likewise, weak knowledge transfer mechanisms have been identified. In all three countries, most academic projects are geared toward scientific publication or large companies, with little impact on the transformation of the real productive apparatus, especially on a small scale.

The most notable difference is *the degree of institutionalization of the university-industry relationship*.

In Chile, there are consolidated experiences of university-business collaboration in recycling and eco-design (e.g., Natural Plas with the University of Concepción), within regulatory frameworks that promote this interaction (REP Law, innovation funds). This environment has created favorable conditions for the emergence of joint projects and the development of applied technologies.

In Colombia, on the other hand, although there are notable academic capacities, especially in regulatory analysis and eco-design, the relationship with the productive sector is fragmented and limited to large companies.

In Argentina, although there is no comprehensive national framework to promote systematic university-industry collaboration, the relationship is evolving and shows varying degrees of development across regions and institutions.

Some universities are advancing in applied research, technology transfer, and community

engagement related to plastic recycling, combining both industrial and social approaches (such as PLAPIQUI at UNS and UNRN).

These efforts reflect a broader trend toward strengthening the academic role in the circular economy transition, despite challenges related to coordination and funding.

Regarding relationships with waste pickers, Colombia has greater regulatory potential (Decree 596 of 2016), which requires their formalization and linkage with managers. However, universities have not been effectively integrated into this process. Chile legally recognizes grassroots recyclers in the EPR Law, but their link with academia is indirect. Argentina, although it has a large number of waste pickers organized in cooperatives, does not have national strategies to integrate these actors into university processes.

The strengths observed in each country allow us to visualize regional synergies. Chile can offer models for institutionalizing university-industry links under enabling regulatory frameworks. Colombia can contribute its regulatory framework for the inclusion of recyclers or waste pickers and its academic base in life cycle analysis and circular economy. Argentina, with its strong experience in technology transfer and territorial presence of cooperatives, can be a setting for implementing pilot projects for technology transfer and co-innovation with recyclers or waste pickers.

Preliminary findings identify the need for universities to become key players in the plastic circularity ecosystem, where it will be necessary to move from a disciplinary research model, in some cases disconnected from business needs, to transdisciplinary innovation approaches with strong territorial roots. This will involve promoting:

- University-industry-community consortia with co-created projects.
- Technology centers applied to local recycling challenges.
- Dual training programs and open innovation laboratories.
- Direct involvement in sectoral governance processes.

Consolidating this role poses internal challenges for academia, such as making structures more flexible, developing new impact metrics, implementing open science policies, and strengthening technology transfer capacities in order to respond to the urgent challenges of a fair, inclusive, and technologically viable circular economy.

3.2.7 Innovation in the Plastics Industry

The plastics sector in Argentina, Chile, and Colombia has been incorporating product and process innovations and new business models for its transition to the circular economy. Both regulations and market opportunities have been important factors in driving these transformations. In all three countries, companies have implemented process innovations related to recycling.

Argentina stands out for incorporating advanced recycling technologies that allow recycled inputs to be obtained with the same quality as virgin material. The Chilean industry has also ventured into advanced infrastructure for recycling and transforming waste into new products. In Colombia, examples have been identified of companies that have incorporated chemical recycling and 100% recycled resins. Digital platforms have also been developed to achieve material traceability. Eco-design is the central focus of product innovations in the sector. In Chile, circular economy strategies from design to reconditioning stand out, and in Colombia, companies have developed compostable designs and products that facilitate reduction, reuse, and recycling, as well as the use of new materials.

On the other hand, in Chile and Colombia, regulations on single-use plastics and Extended Producer Responsibility (EPR) have encouraged product and process innovation. In terms of new business models, regulatory and market pressure, and opportunities identified by companies have encouraged collaborative actions in all three countries to comply with regulations or preserve their reputation in the face of green market trends. The innovation dynamic has advanced gradually in all three countries, with differences between types of companies and actors in the value chain. However, the just transition to the circular economy requires forms of collaborative innovation that overcome the marginalization and exclusion of social groups such as recyclers or waste pickers ([Barford and Ahmad, 2021](#); [Becerra et al., 2020](#); [Bermudez et al., 2019](#); [Duarte et al., 2020](#); [Garca Parra et al., 2023](#); [Kain et al., 2022](#))

Conclusions

The comparative analysis of the plastics industry in Argentina, Chile, and Colombia reveals both common patterns and country-specific conditions that shape the opportunities and challenges of transitioning toward a circular economy. Despite differences in regulatory maturity, technological development, and institutional capacity -with Chile standing out for its regulatory consistency, Colombia for its diverse policy instruments and academic engagement, and Argentina for its productive depth and territorial reach- all three countries face structural barriers that hinder a systemic transformation of the plastics value chain.

Across all cases, the industry remains highly concentrated geographically and strongly reliant on a limited group of polymers (PE, PP, PVC, PET, PS), primarily used in packaging, construction, agriculture, and consumer goods. These same sectors represent the greatest potential for circular strategies, particularly in the areas of waste management, recycled material integration, and product redesign.

However, circularity is not only a matter of technical capacity or material flows. It requires systemic innovation and a reconfiguration of how actors interact along the value chain. In this regard, recyclers (especially informal or grassroots) play a critical role in sustaining secondary material flows. Yet their precarious working conditions, invisibility in governance spaces, and limited access to technological innovation severely restrict the potential for a truly inclusive and functional circular economy. Integrating these actors demands not only formalization, but also an institutional redesign of the value chain, where equity and participation become structural principles.

Universities must play a central role in this transformation. Their potential as agents of training, technological development, territorial governance, and impact assessment is evident, but

underutilized. This requires moving from a logic of knowledge production toward one of co-creation of solutions, where academia acts as a bridge between technology, public policy, and grassroots social practices. A truly circular plastics economy cannot rely solely on national-level policy. It must be built locally, through multilevel governance, cross-sector partnerships, decentralized financing, and inclusive innovation platforms. The TechTraPlastiCE project has an important opportunity to enable these changes by strengthening trilateral collaboration, supporting recycler-led innovation incubators, and promoting applied R&D that integrates sustainability, productivity, and social inclusion.

In summary, the path toward circularity in the plastics sector involves aligning environmental goals with social equity and innovation. Argentina, Chile, and Colombia are advancing along this path at different speeds, but with shared challenges that open the door for joint strategies. The following stage will explore in depth the key factors and actors influencing this transition, identifying leverage points for coordinated action.

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Annex

A.1 Gap analysis for companies and industries – Argentina

A PLASTIC INDUSTRY, BARRIERS AND OPPOTUNITIES: ARGENTINA

A.1 THE PLASTIC INDUSTRY AT NATIONAL LEVEL

A.1.1 Description of the national plastics industry

The plastics sector in Argentina is made up of raw material producers, distributors, the plastics processing industry, the plastics recycling industry, urban recyclers, chambers of commerce, and associations. It provides more than 56,000 direct skilled jobs, 224,000 indirect jobs, and 2,800 companies, representing just over 5% of the industrial workforce. Also involved in the activity are more than 150,000 urban recyclers present in several cities and more than 300 recycling companies located throughout all Argentine provinces. Of the total number of recycling companies, approximately 50% recover plastic material, employing at least 50,000 workers.

In the case of the plastics processing industry, four types of companies can be distinguished:

- Medium-sized, domestically owned companies that produce differentiated products: These are generally family-owned businesses, which constitute the founding core of the plastics industry in Argentina. They possess modern machinery and equipment, and many of these firms are exporters. Some of these firms are active in the pipe, PVC compound, PS tray, PE film, and other segments.
- Medium-sized companies that produce commodities: the typical case is that of producers of T-shirt bags and rolls of rolls for supermarkets.
- Transnationals: These are mostly medium-sized or medium-large companies that entered Argentina by purchasing local firms or by setting up their own plants.
- Small family businesses: They typically supply small market segments or perform work for third parties. They have a low level of technological sophistication.

Likewise, there are around 2,750 plastics manufacturing companies in Argentina, which directly employ 56,000 workers (CAIP).

Table A.1 Structure of the plastics industry in Argentina. Source: CAIP, 2024.

Year	Number of industries	Workers
1990	3500	38000
2000	2385	32300
2005	2285	45500
2010	2710	50600
2015	2810	55500
2020	2720	50300
2023	2750	56000

Regarding urban waste pickers, some aspects are detailed below to better understand the situation. According to data from the Argentine Federation of Carreros, Cartoneros, and Urban Recyclers (FACCYR), in 2023 there were an estimated 150,000 urban waste pickers working in Argentina. However, only 18,000 workers were registered with the Federation and organized into waste picker companies (the vast majority in urban waste picker cooperatives) distributed throughout all of Argentina's provinces.

Recycling is a fundamental component of the circular economy, as it is the main source of raw materials. There is a diverse universe of entities and self-employed workers who carry out this work on a daily basis. According to official data from the Ministry of Social Development of the Argentine Republic (2023), there are 385 production units dedicated to the recovery of recyclable materials throughout the country¹, most of whom are registered with the Argentine Federation of Urban Cart Collectors and Recyclers (FACCYR). These organizations bring together grassroots recyclers who collaborate with local collection and processing units—green centers, regional processing and logistics centers—and/or work on projects involving special waste streams and added value. This economic activity of informally recovering and selling materials found among waste has expanded significantly in Latin America following successive periods of socioeconomic crisis, as the task of recovering recyclables from waste serves as a means of subsistence. Urban recyclers, as a new social subject, are known as "cirujas" or "cartoneros" (Dimarco, 2007) in Argentina, "cachureros" in Chile, or "recicladores" in Colombia (Terraza and Sturzenegger, 2010; Paiva, 2013).

The plastics recovery sector is comprised of countless recycling companies, which come in various forms, including cooperatives, mutual funds, civil associations, and foundations; and self-employed recyclers, whose activities aim to enhance collection, recycling, and environmental care within the framework of the circular economy.

The sector that recovers plastics and other recyclable materials, at best, sells the recovered material directly to the recycling industry, making sales to local intermediaries under a very weak commercial relationship. Currently in Argentina, recycling companies are experiencing a significant crisis, mainly due to the precipitous drop in the prices of recyclable materials—including plastic—making the task unprofitable. The opening of imports directly impacts the national production process, and recycling companies are no exception.

B.1.2 Geographical and economic distribution

The plastics industry has a geographical distribution concentrated in urban and industrial centers, as can be seen in Figure 1, among which AMBA, Córdoba, Santa Fe, and Mendoza

¹ These official data are from 2023 where the Argentine State developed an active policy of Advice and support through financing for supplies, machinery, work tools, equipment, clothing, and safety equipment for the development of recovery companies. In turn, The sector had been strengthening thanks to strong market prices for recyclable materials. Numerical data on the number of production units and urban recyclers can be found at: <https://www.argentina.gob.ar/capital-humano/familia/inclusion-laboral-y-economia-popular/argentina-recicla/m-apa-federal-de>

stand out (CAIP, 2024). Meanwhile, recycling companies are present in at least 19 provinces, articulated through initiatives such as the Federal Recycling Map, which seeks to strengthen inclusive and sustainable waste management. This map can be viewed at the following link: "Recycling Map" This Federal Map provides visibility into the recycling value chain and seeks to strengthen Integrated and Inclusive Urban Solid Waste Management (ISUWM).

Regarding Recycling Companies or Production Units, the Federal Recycling Map shows that they are distributed throughout all of Argentina's provinces, primarily in the largest cities. Generally, these Production Units do not only process plastic, but also recover other materials such as cardboard, paper, glass, etc. The materials recovered vary in each location, depending on the quantity and quality of the materials most commonly found, the predominant economic activity, the existing buyers, and the market price. Without a doubt, plastic, in its various forms, is one of the materials with the highest recovery rates, along with cellulose and some metals.

Then, regarding the geographical distribution in Argentina of the companies corresponding to the plastics processing industry (CAIP, 2024) it is presented in the following figure:

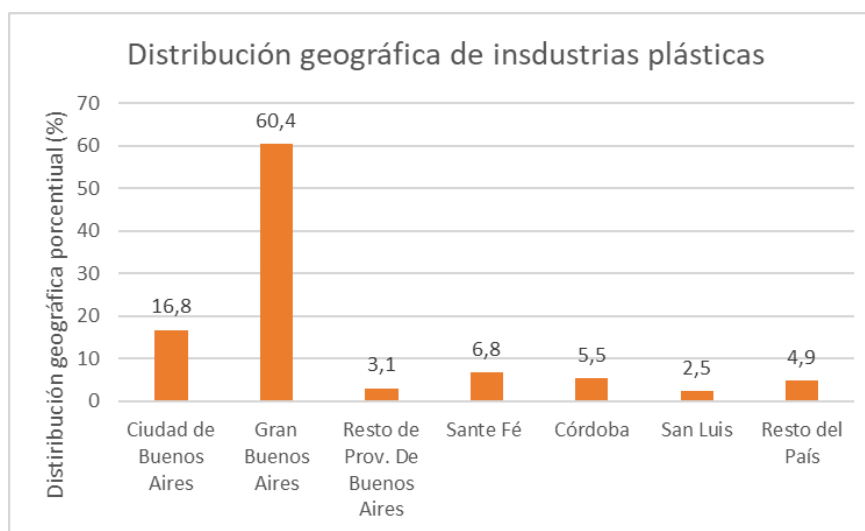


Figure A.1 Geographic distribution of the plastics industry in Argentina. Source: CAIP, 2024.

B.1.3 Main plastic products

Regarding the most relevant polymers in the Argentine market, the following stand out: low- and high-density polyethylene (LDPE and HDPE), polypropylene (PP), polyvinyl chloride (PVC), and polyethylene terephthalate (PET). Table A.2 presents the production, imports,

exports, and apparent consumption in tons reported for 2023. Additionally, Figure A.2 shows the evolution of annual per capita plastic consumption in Argentina from 2000 to 2023.

The plastic collection industry adapts to demand, based on market prices and the type of material prevalent in each location. Generally speaking, the plastics with the highest recovery rates are PET, HDPE, LDPE, and PP. These are processed according to the industry's needs (color separation, different qualities, etc.).

Table A.2 Apparent consumption of plastics in Argentina. Source: CAIP, 2024.

Raw material	Production (t)	Import (t)	Export (t)	Apparent consumption (t)
LOW DENSITY POLYETHYLENE	397476	240676	150108	488044
HIGH DENSITY POLYETHYLENE	283406	89326	89333	283399
PVC	194865	10392	48084	157173
POLYPROPYLENE	316773	96020	45661	367132
POLYSTYRENE	58146	3904	8974	53076
EXPANDABLE POLYSTYRENE	20800	7989	58	28731
PET	178100	54476	8725	223851
ABS	(3)	9147	s/d	9147
SAN	(3)	986	59	927
PHENOLIC RESINS	1105	5235	250	6090
POLYESTER RESINS	4600	9768	6143	8225
POLYAMIDE (1)	500	16895	3577	13818
POLYETHERES	0	31841	2531	29310
COCLOPÉMERO EVA (2)	0	242	69	173
POLYCARBONATE (2)	-	8338	196	8142
MELAMINE RESINS	-	21103	399	20704
OTHER RAW MATERIALS	s/d	280124	33283	246841
TOTAL	1455771	886462	397450	1944783

Notes: Data for Low Density Polyethylene include those for Linear Low Density Polyethylene. - (1) Data for Polyamide 6 and 66 - There is no local production of Polyamides 11 and 12. - (2) There is no local production - (3) There was no local production.

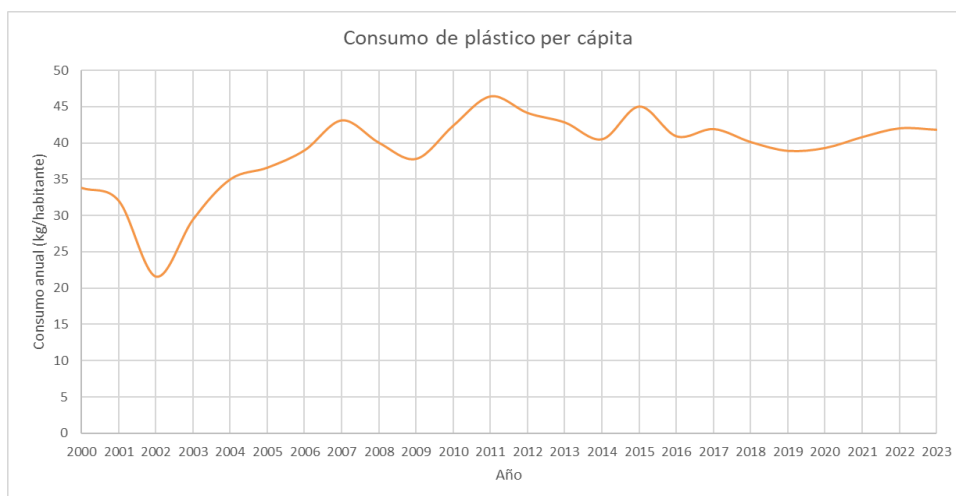


Figure A.2 Evolution of per capita plastic consumption in Argentina (in kg/inhabitant) between 2000 and 2023. Geographical distribution of plastics industries in Argentina.
Source: CAIP, 2024.

B.1.2 Main end applications of plastic products at the local level

In Argentina, the aforementioned plastic materials are used in sectors such as packaging, construction, automotive, agriculture, and household appliances. A more detailed percentage distribution is presented in Figure A.3.

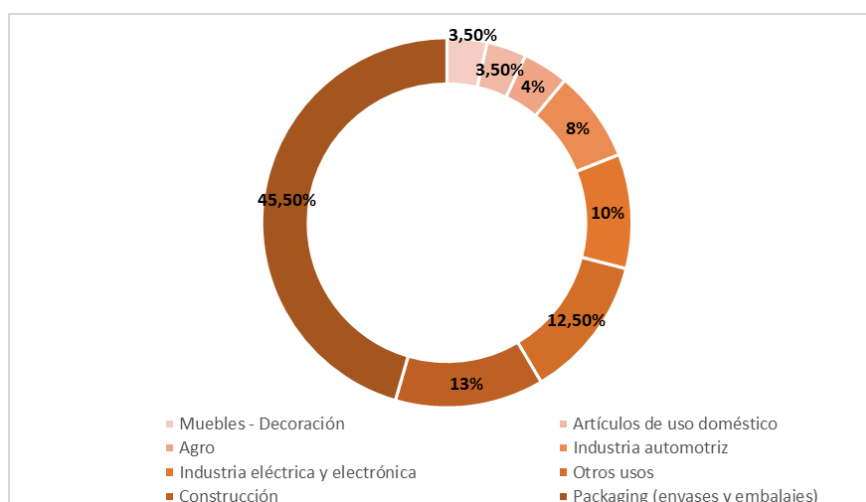


Figure A.3 Percentage distribution of end uses of plastic products in Argentina (2023). Source: CAIP, 2024

Analyzing Figure A.3, we can see that 13% of plastics are used in the construction industry, specifically in the manufacture of gas and water pipes, drains, cable sheathing, light fixtures, decking, wall insulation, window frames and profiles, door trim, and furniture. In the electrical and electronics sector, 10% of plastics are used in the production of cell phones, flash drives, computers, automated equipment, air conditioning units, and household appliances. In this case, plastic is used to make casings, insulation systems, and data conduction systems, among other components, thus reducing the weight and size of the equipment.

In transportation, plastics are part of the means of transport used daily to transport passengers, such as cars, buses, trains, subways, airplanes, etc. This sector uses 8% of the total plastic produced. The agricultural industry also consumes this type of material. Silo bags, seedbeds, greenhouses, and drip irrigation hoses are some of the products made from plastics. Recently, new applications have emerged, such as the manufacture of fence posts and vineyards made from plastic lumber, which is produced from recycled materials.

Another area where plastics are essential is medicine and healthcare. In this case, plastics are present in medication packaging, diagnostic and treatment equipment, and in plastic items such as gloves, masks, gowns, and medical materials that prevent the spread of disease. They also appear in other applications such as pill coatings, syringes, IV bags, catheters, disposable syringes, prosthetics and suture threads, and prosthetics, among many others.

Finally, it's worth highlighting that plastic materials are found in other products such as textiles, clothing, protective gear like helmets and knee pads, sports equipment like nets and ropes, fishing nets and gear, toys, stationery, eyeglasses, furniture, picture frames, posters, etc. They are also essential elements in innovative technologies such as robotics and 3D printing, as they have enabled the manufacture of a wide variety of products such as medical and dental implants, improving our quality of life. (Guide: Plastics in the Circular Economy. Ecoplas 2023).

B.1.3 Segments of the plastics production chain that have the greatest potential for adopting circular economy models

To conduct this preliminary analysis, based on the characteristics of the plastics value chain in Argentina, potential circular models include mechanical and chemical recycling, product eco-design, the substitution of virgin raw materials for recycled materials, and the creation of new markets for recycled materials. In turn, the adaptation and implementation of public policies, investment in technology, environmental education, and collaboration with urban recyclers are crucial factors in driving this transition. In this regard, the following strategies were identified:

1. Production of raw materials:

- Although more concentrated in large petrochemicals, there is potential to develop recycled or bio-based resins;
- investments in technology and incentive policies are required.

2. Transformation and manufacturing:

- processes can be adopted to incorporate recycled materials;
- designing products with recyclability in mind (ecodesign);
- implement more efficient and less wasteful production systems;
- innovate with bioplastics or biodegradable plastics that complement the circular economy.

3. Distribution and marketing:

- They can promote reuse models, return and resale systems;
- encourage the reduction of single-use plastics and promote responsible consumption.

4. Waste management and recycling:

- It is the segment with the greatest immediate potential;
- Argentina has a recycling sector that can grow significantly, both formally and informally;
- Incorporate selective collection systems, mechanical and chemical recycling, and recovery of plastic waste;
- The use of recycled plastics for the manufacture of new products reduces the use of raw materials.

As a preliminary conclusion, in Argentina, recycling and plastic waste management not only has the greatest potential, but there is also an immediate need to implement circular economy strategies to improve infrastructure and recovery systems. However, for a

systemic impact, it is also key to work at the transformation and manufacturing stages, using eco-design strategies that increase the recyclability of post-consumer products and reduce the generation of plastic waste that ends up in landfills. Additionally, it is important to mention that raw material production has potential, although it depends on raw material availability, technological investment, and industrial policies.

B.2 KEY FACTORS AND ACTORS IN THE TRANSITION TOWARDS THE CIRCULAR ECONOMY

B.2.1 Opportunities to promote the circular economy in the plastics sector

To promote the circular economy in the plastics sector, there are a wide range of key opportunities to improve sustainability, resource efficiency, and waste reduction. These opportunities can range from technological innovations to changes in business models, strengthening public policies, and raising consumer awareness. Among the key opportunities to promote the circular economy in this sector are:

a) Improve plastic collection and sorting systems:

Regarding collection logistics, improvements can be achieved by implementing geolocation and route optimization technologies that improve process efficiency and reduce costs.

Regarding sorting, in addition to incorporating technologies to sort plastics more quickly and accurately, it is necessary to work on on-site sorting of solid waste to facilitate the subsequent sorting process. This simplifies this stage of the plastics recycling chain and facilitates the mechanical recycling process.

It is also necessary to improve this system by promoting the creation of local recycling centers and plastic collection points to facilitate community management and reduce waste transportation. These centers' purpose is to decentralize the system and facilitate logistics.

b) Ecodesign and sustainable products:

Design for recyclability: Promote eco-design, where plastics are designed from the outset to be easier to recycle, using homogeneous materials and avoiding the use of additives that make recycling difficult.

Biodegradable or compostable plastics: Promote the development of alternative plastics that are biodegradable or compostable, especially in single-use applications, which could reduce the accumulation of plastic waste.

Material reduction in design: Innovate in the design of plastic products that use less material or recycled materials to reduce the amount of new plastics in circulation.

c) Innovations in processing technologies:

Chemical recycling: advancing chemical recycling technologies, which allow complex plastics to be broken down and transformed into more valuable monomers or products, without losing quality in the process.

Advanced recycling: Investing in new technologies that enable plastic recycling, maintaining the quality of the material after each recycling cycle.

d) Develop the market for recycled products:

Green certification and labeling: Promote the creation of labels and certifications that identify products made with recycled materials, encouraging consumers to choose sustainable products.

Markets for recycled plastics: Create a stable demand market for products made with recycled plastics, incentivizing producers to use these materials instead of virgin plastics through tax incentives or subsidies.

Boosting key industries: Promoting the use of recycled plastics in industrial sectors such as automotive, construction, and fashion, where demand for sustainable materials is growing.

e) Public policies and regulations:

Ban single-use plastics: Establish stricter regulations that limit or eliminate single-use plastics, promoting recyclable or biodegradable alternatives.

Incentives for innovation and recycling: Create tax incentives for companies that invest in recycling technologies, sustainable production processes, and the use of recycled plastics.

Recyclability standards: Establish clear regulations on plastics recyclability standards and requirements for their design and processing, facilitating the transition to a circular economy.

f) Consumer education and awareness:

Awareness campaigns: Conduct educational campaigns at the global and local levels to raise consumer awareness about the importance of waste separation and recycling, and the impact of their purchasing decisions.

Promoting waste separation: Establish more accessible and user-friendly collection systems, such as using different-colored containers to facilitate plastic sorting in homes and businesses.

Promoting the circular economy: Promoting understanding of the benefits of the circular economy in society, showing how it can contribute to waste reduction and sustainability.

g) Collaboration between sectors:

Business-to-business partnerships: fostering collaboration between plastics manufacturers, recyclers, researchers, and governments to share knowledge and develop innovative and scalable solutions for plastics recycling and reuse.

Collaborative business models: Establishing business models based on the rental, repair, or reuse of plastic products can help reduce the demand for new plastics and promote longer lifecycles.

h) Innovation in new materials:

Development of alternative plastics: Invest in research into new materials that can replace conventional plastics, such as bioplastics, plastics made from renewable resources, or plastics with improved recycling properties.

B.2.2 Barriers faced by companies in the transition to the circular economy

Among the weaknesses and/or barriers that local companies face in the transition towards a circular economy, the following can be mentioned:

- a) **Few initiatives to convert production:** The plastic waste generated in the country shows a high contribution of those derived from disposable objects and packaging (single-use), with a short useful life, or those that use multiple materials, adhesives, labels, inks, or metallization in their production that make recyclability difficult. Furthermore, the percentage of recycled material incorporated into new products tends to be low. All of this demonstrates a limited incorporation of eco-design criteria in the business models linked to this trend, which could reverse this trend by producing more durable goods and/or easier to incorporate into recycling circuits. The initiatives deployed in this regard are specific and limited. For example, regulations that prohibit some single-use disposables such as straws and supermarket bags (the Autonomous City of Buenos Aires, as of the Resolution 816/2019, prohibits the distribution of plastic straws; or the province of Buenos Aires, as of the Law 13.868/2008 (prohibits the distribution of non-degradable bags in supermarkets and similar stores). An example associated with a redefinition carried out at the product design level has been the incorporation of improvements in PET containers that minimize the amount of materials used in their manufacture, or the replacement, generally partial, of virgin materials with recycled ones. Another aspect of this problem is the widespread use of multi-plastic packaging that has significant difficulties in being recycled (pouch or doy-pack type). Although they are presented to consumers as "eco-friendly," they have received virtually no attention, either from the manufacturing/packaging industries or from the competent authorities in the matter.
- b) **Raw material:** Obtaining post-consumer plastic waste generally presents problems of quantity, cleanliness, separation, quality, and continuity. The main solution is to implement source separation and separate collection.
- c) **Recycling process costs:** These depend largely on the conditions in which the waste is received and the impact of electricity costs. The solution lies in proper separation and collection, as well as special rates for the recycling industry.
- d) **Final product sales price:** Recycled products are capped at the price of virgin products, generally related to the value of raw materials. The solution to this problem is to require the processing industry to use a minimum percentage of recycled material. One

possible solution is to require the processing industry to use a minimum percentage of recycled material.

e) **Dependence on international commodity prices and exchange rates:** A recurring dynamic occurs when there is a drop in the price of oil (fixed internationally) and a decrease in the exchange rate. Both phenomena make the use of virgin material relatively cheaper than the possible recycled component. Consequently, whenever the international price of oil and/or the exchange rate decreases, so does the quantity of recovered plastics demanded by the recycling and processing industry as inputs for production, because the price producers are willing to pay is limited by the price of virgin material. Thus, these aspects linked to international trade impact the entire plastic waste recovery chain, affecting its profitability and, consequently, its demand, effective recycling, and the recyclers' prospects for social inclusion.

f) **Territorial asymmetries in the distribution of demand for recovered plastic materials:** Plastic waste generation occurs at uneven rates across the country, depending on population dispersion and socioeconomic characteristics. Demand for these materials is heavily concentrated in the large cities of the Pampas region. This causes the impact of logistics costs to decouple the prices of materials generated and recovered in remote locations from those close to these recycling and processing sites. It also incentivizes intermediation, generating negative marketing conditions, to the point of inhibiting the existence of economic incentives for their recovery. In response to this, grassroots recycling organizations are testing alternatives for collective sales directly to the recycling industry, defining or projecting possible multimodal transportation formats (rail-truck) and appropriate transportation for lightweight, high-volume materials (such as double-trailer trucks), as well as establishing regionalization criteria for their collection. However, the impact of logistics costs is the main obstacle to stabilizing this alternative.

g) **Lack of regulations for the implementation of differentiated collection schemes:** The lack of a packaging law aimed at establishing minimum budgets and the EPR (Recycling and Recycling Regulation) results in a lack of responsibility for the management and financing of the recovery chain for these materials. This occurs because producers often evade the responsibility of recovering and properly treating waste, while municipalities lack sufficient capacity (mainly budgetary) to do so. Thus, within recyclable plastics, when the exchange rate and international prices allow (as previously analyzed), a segregation develops between those prioritized for marketing and recovery over others (PET or HDPE over PVC or PP), given their demand that offers higher prices, greater stability, and better market access, while the rest practically lose interest in their recovery. In turn, the absence of EPR regulations leaves no useful tool to promote the redesign of materials at the production stage.

Thus, the transition to a circular economy for plastic waste requires integrating multiple scales. Material recovery efforts, which by Argentine regulations are local, must be linked to dynamics and critical points that operate primarily at the national and subnational levels.

B.2.3 Key players in the transition to the circular economy

The transition to a circular economy in the plastics sector is undoubtedly a challenge that requires the collaboration of society as a whole. All actors in the value chain are fundamental to the transition to circular models and can play different roles.

- a) **Public sector:** To support the migration to circularity by creating an enabling environment to foster sustainable production and consumption models through regulations, economic incentives, and coordination between the knowledge sector and the private sector to foster research, development, and innovation (R&D&I) to drive solutions to common challenges, among others.
- b) **The private sector,** which encompasses both companies and the chambers or associations that represent them, must migrate from a linear production model to a production logic based on the circular economy. The sector can promote various actions for this transition, including: measuring the circularity of its products and services and evaluating its progress; incorporating ecodesign to produce goods and services with the lowest possible environmental impact; generating synergies to foster industrial symbiosis and thus ensure the utilization of 100% of byproducts; using raw materials from waste or renewable sources; selling in bulk or with reusable packaging; optimizing resources; and implementing new logistics circuits for the delivery of goods and services through shared economy or servitization strategies (product as a service), among others.
- c) **Knowledge sector:** universities, research centers, technology linkage units, institutes, national and international agencies, and organizations can finance and promote R&D&I projects to generate circular solutions to various problems. The synergy between this sector and the private sector is key to laying the foundation for new businesses and innovation-based solutions.
- d) **Social sector:** Society can also contribute to the emergence of circular solutions, as well as the cultural shift needed to drive the transition. The tools at their disposal to demand more sustainable production and supply include participation in social mobilizations, awareness-raising campaigns, and participatory budgeting, as well as their individual consumption decisions, among others.
- e) **Media:** They play a fundamental role in cultural change. They are both spokespersons and shapers of public opinion, and generate consumer and thought trends. The dissemination of circular economy initiatives, as well as habits that people can adopt in their daily lives, are just some of the actions this sector can take.

B.2.4 Relationship between factors and actors

In the transition to a circular economy, stakeholders (governments, businesses, universities, cooperatives, civil society, and international organizations) must interact dynamically, influenced by regulatory, economic, technological, social, and environmental factors. For example, regulatory frameworks established by the State, such as waste management laws or extended producer responsibility (EPR), directly impact how companies design their products or manage their waste. Universities, in turn, provide technical knowledge and generate training and innovation spaces that inform both the productive sector and public policies. Cooperatives and recyclers, often in coordination with local governments, play a key role in waste collection and recovery, and are social actors that require formalization and support. These ties are strengthened or weakened depending on the availability of economic incentives, appropriate technology, and social acceptance, highlighting the need for collaborative governance to move toward a circular model. The above represents an ideal that does not exist in Argentina. Although there are interactions of this type at the provincial or local level in some cases, there is no organized system at the national level.

B.2.5 Policies and strategies to strengthen relationships between stakeholders

To strengthen relationships between stakeholders in the circular economy and improve their interaction with the factors that shape it, it is essential to implement integrated, multisectoral policies.

First, it is essential to establish a clear and progressive regulatory framework at the national level that unifies criteria and obligations. Likewise, economic incentives (subsidies, tax benefits, or access to specific financing) must be promoted for companies and cooperatives that adopt circular practices.

Universities and research centers need support to develop applied technologies and technical training programs, which in turn boost employability in green sectors.

Another strategy could be to institutionalize multi-stakeholder dialogue spaces, such as regional roundtables or circular innovation platforms, where common goals can be agreed upon and joint action plans mapped out.

Finally, environmental education and the implementation of sustainable public procurement can act as social multipliers to consolidate a long-term circular culture. These purchases represent a process by which government entities acquire goods, services, and works in a

way that minimizes negative impacts on the environment, promotes social inclusion, and generates long-term economic value.

B.2.6 Plastic recycling in Argentina

According to the recycling index developed by the civil association Ecoplas and the Chamber of the Plastics Recycling Industry (CAIRPLAS), more than 4 million tons of plastic were recycled in Argentina between 2003 and 2023, preventing the emission of more than 5.7 million tons of carbon dioxide. Argentina recycles 15.12% of its total plastic, which is "good" compared to the region, despite lacking accompanying legislation. The EPR law is opposed by companies—although Brazil, Chile, and Uruguay already have similar laws for all types of materials, and Spain enacted it in 2011, and the amount of recycled packaging grew 37-fold—in a context where multinationals offset the targets they fail to meet in Argentina with those they over-meet elsewhere in the world.

Although global recycling rates are relatively low (13.5% worldwide), more and more nations are dedicating their efforts to improving these levels, especially in Europe, where several countries have recycling rates above 50%. For example, in Switzerland, recycling is mandatory, and those who fail to comply face fines that can exceed €10,000 in the most extreme cases. Non-recycled material is incinerated and generates energy for more than 250,000 homes. To give a few examples, 83% of plastic bottles are recovered. Other highly relevant cases are Sweden and Norway, which recycle so much waste that they were forced to import waste from the rest of Europe. This happened because their inhabitants do not produce enough waste to fully supply their recycling plants. It is well known that the Nordic countries have a genuine environmental commitment to improving the well-being of their citizens and the natural environment of their regions. Outside of Europe, only one country on the list has levels above 50%, and that's South Korea. South Korea allocates 2% of its GDP to environmental programs, making them mandatory and offering certain benefits to incentivize its citizens. The other countries on the list are Austria, Germany, Belgium, and the Netherlands.

B.2.7 Relationship between the Academy and the Plastics Industry at the national level

There are different stages of academic-industry engagement. In some universities and/or associated research institutes, it is more incipient than in others, depending on the location and the place that plastics recycling occupies on the public agenda in different regions. PLAPIQUI, in particular, maintains active engagement with the industrial sector and plastics recycling through applied research, technological development, and transfer projects. Drawing on its experience in process engineering and materials science, the institute works on the design and optimization of technologies for the mechanical, chemical, and energy

recycling of plastic waste, especially those that are difficult to recover, such as mixtures, materials with mineral fillers, or those originating from complex streams such as WEEE. It also collaborates with companies in the petrochemical sector, recyclers, and packaging manufacturers, providing technical assistance, advanced material characterization, and analysis of physical, thermal, and mechanical properties. This engagement also extends to the public and social spheres, through training, services to cooperatives and municipalities, and participation in circular economy strategies. In this way, PLAPIQUI provides scientific knowledge and practical tools to improve the efficiency, traceability, and sustainability of plastics recycling in the region.

For its part, UNRN develops strong collaboration with the recycling sector through outreach activities that prioritize links with urban recyclers and social organizations. A core part of its work focuses on promoting comprehensive waste management with a territorial approach, conducting source separation workshops on its campuses and supporting community processes linked to recycling. Within this framework, it actively collaborates with cooperatives and recycling groups, strengthening their organizational and technical capacities and promoting practices that recover both organic and inorganic waste. This strategy combines training, support, and direct action, with a strong commitment to the social and solidarity economy. Unlike approaches more focused on technology or industry, UNRN places special emphasis on the social component of recycling, recognizing and supporting the key role played by informal sector workers in building a fair and inclusive circular economy.

B.2.8 Innovation in the plastics industry

The Argentine plastics industry is advancing in the incorporation of new technologies such as advanced recycling, a strategic alternative for the revaluation of plastics, as it complements the traditional mechanical method responsible for recovering post-consumer materials from domestic, industrial, commercial, and agricultural applications. In this regard, Resolution No. 220/2023 approved the agreement between YPF S.A. and the Ministry of the Environment of the Province of Buenos Aires for the development of a pilot test for pyrolysis of plastic waste, one of the advanced recycling technologies. It is important to highlight that this technology allows for the production of recycled materials with the same quality as virgin materials and contributes to reducing the amount of waste disposed of in landfills. Therefore, it contributes to the mitigation of greenhouse gas emissions, which have a direct impact on the climate change crisis affecting the planet.

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A.2 Gap analysis for companies and industries – Chile

B PLASTIC INDUSTRY, BARRIERS AND OPPORTUNITIES: CHILE

B.1 THE PLASTICS INDUSTRY AT THE NATIONAL LEVEL

B.1.1 Description of the national plastics industry

The plastics industry in Chile is a key sector in the local economy, with a significant presence in various production areas. Because the country does not produce virgin plastic resins, industrial activity focuses primarily on the processing of imported raw materials for the manufacture of final plastic products for sectors such as packaging, construction, agriculture, and mining.

In structural terms, the Chilean plastics sector is made up of approximately 520 companies, ranging from producers and marketers of raw materials to plastic transformers, recyclers, waste managers and suppliers of specialized machinery and services (Alomar, 2021; ASIPLA, 2024). However, there is a marked trend in the sector: 28% of companies (147 large companies) generate 82% of the associated direct jobs, reflecting a predominance of large industrial players (ASIPLA, 2024).

Among the most important products manufactured by the plastics industry in Chile are:

- Packaging: These represent almost half of the country's plastic consumption and include bags, bottles, protective films, and rigid and flexible packaging.
- Construction Materials: Pipes, coatings, insulation, and structural components that take advantage of the durability and strength of plastics.
- Products for Agriculture and Mining: Irrigation systems, greenhouses, netting, coverings, and material transport systems.
- Everyday and Retail Items: Reusable bags, household items, and food packaging.

In 2023, apparent plastic consumption in Chile reached 1,245,000 tons (ASIPLA, 2023), while per capita consumption stood at approximately 50 kilograms per person per year, placing Chile above countries like Colombia, although still below the standards of European Union nations (Gallardo, M., 2022).

The plastics production chain in Chile includes diverse actors with fundamental roles in the transition to a circular economy model. Key players include:

1. Plastic Transformers:

They constitute the largest group, with around 340 companies dedicated to the production of final goods for various sectors such as packaging, construction, agriculture and mining (Gaete, R., 2021).

2. **Grassroots recyclers:**

They are individuals who, independently or in associations, collect, separate, and market waste for recycling. They generate their income by selling recyclable materials to recovery companies, intermediaries, and recycling centers.

3. **Waste managers and recyclers:**

Organizations responsible for the comprehensive management of plastic waste, including its collection, transportation, and final disposal. They act as intermediaries to close the life cycle of plastic products, facilitating their collection, sorting, transportation, and treatment. In 2022, recycled plastic production reached 106,870 tons, with an installed capacity of 155,000 tons nationwide (Pacto Chileno de los Plásticos, 2024).

4. **Distributors and Marketers:**

Actors responsible for the distribution and sale of plastic products to various markets, ensuring that the products reach the final consumer.

5. **Consumers:**

Both companies and individuals use plastic products in their daily operations or personal consumption. Their behavior and preferences influence demand and recycling and reuse practices.

B.1.2 Main applications of plastic at the local level

In 2023, the main plastic-consuming sectors in Chile reflect the importance of this material in various key industries of the national economy. The packaging sector leads the way, accounting for 48% of the total. Plastics are widely used in the manufacture of packaging for food, beverages, cleaning products, and cosmetics, thanks to their versatility and ability to preserve product quality.

The construction industry ranks second, accounting for 21% of plastic consumption. This material is used in pipes, coatings, insulation, and structural components, and is noted for its durability and corrosion resistance, essential characteristics in infrastructure projects.

In the case of mining, this sector consumes approximately 8% of the plastics used in Chile. Plastics are used in material transport systems, pipes, and coatings, where their chemical and mechanical resistance is essential for mining operations.

The agriculture and fishing sectors also account for 8% of plastic consumption. This material is used in irrigation systems, greenhouses, netting, and packaging, contributing significantly to the efficiency and protection of crops and fishery products.

The retail and other sectors consume approximately another 8%, primarily bags, packaging, and disposable products. Finally, the remaining 7% is distributed across

sectors such as home, leisure, and sports, reflecting the diversity of plastic applications in everyday life.

This distribution highlights the relevance of plastic in key sectors of the Chilean economy, and indicates that nearly half of the plastics are destined for long-term applications (≥ 5 years) (Caballero, 2024).

B.1.3 Geographical and economic distribution

The plastics industry in Chile is a complex ecosystem that integrates multiple actors and activities. Geographically, the industry shows a high concentration in the central macro-zone of the country (from the Valparaíso region to the Maule region), where 88% of the companies in the sector are located. Meanwhile, the southern/austral macro-zone (from the Ñuble region to the Magallanes and Chilean Antarctica region) and the northern macro-zone (from the Arica and Parinacota region to the Coquimbo region) account for 9% and 3%, respectively (ASIPLA, 2024). This concentration in the Central Macrozone, which includes the Valparaíso, Metropolitan, and O'Higgins regions, is due to its proximity to major urban and consumer centers, as well as the available logistics infrastructure.

In 2023, according to statistics, the main plastics consuming sectors in Chile are (Circular Country, 2024):

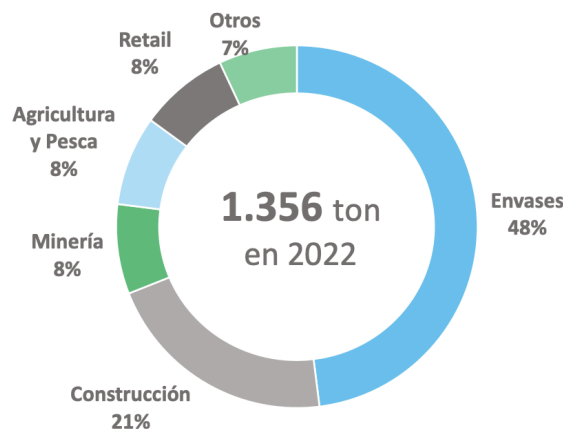


Figure B.1 Distribution of plastic consumption in Chile.
Source: ASIPLA, 2023.

The geographic concentration and sectoral distribution of plastics consumption in Chile reflect the economic priorities and opportunities to implement circular economy practices in the country's different regions and productive sectors.

B.2 KEY FACTORS AND ACTORS IN THE TRANSITION TO THE CIRCULAR ECONOMY

B.2.1 Opportunities to promote the circular economy in the plastics sector

National context

In Chile, environmental awareness has grown significantly in recent decades, becoming a driving force for changes in consumer habits and business dynamics. There is broad consensus on the need to move toward a development model that decouples economic growth from the consumption of finite resources, which has led more and more consumers to prioritize products and services that minimize their environmental impact (Scapini & Berríos, 2021).

Recycling, which began as an informal practice in the 1990s, is now considered a key pillar of the country's sustainability. The consolidation of a truly circular economy requires moving toward what some call a "trash culture" (Tendencias y Cultura, 2020), where both the productive sector and the general public take active roles in reducing, reusing, and recovering waste.

Educational institutions play an essential role in this process, not only by educating future, conscious citizens, but also as spaces for research, technology transfer, and collaboration with industry. Strengthening environmental education and incorporating sustainability practices at different educational levels fosters the development of a more informed and active citizenry that demands innovative and sustainable solutions (Scapini & Berríos, 2021).

In terms of policy, Chile has implemented key instruments to promote the circular economy, particularly the Extended Producer Responsibility Law (EPR) and the Single-Use Plastics Law. The EPR Law requires companies to manage the life cycle of their products, establishing specific collection and recycling targets for containers and packaging (Scapini & Berríos, 2021). The Single-Use Plastics Law seeks to progressively reduce the use of disposable plastic products, promoting reusable, recyclable, or compostable alternatives, as well as reuse systems such as returnable cups or refillable containers.

These regulatory frameworks have encouraged companies to redesign products, incorporate sustainable materials, and innovate processes, generating not only regulatory compliance but also opportunities to access new markets and respond to increasingly conscious consumers (Scapini & Berríos, 2021). Furthermore, the Roadmap for a Circular Chile by 2040 acts as a strategic framework that establishes goals such as increasing the recycling rate from the current 4% (2021) to 65% in 2040, reducing waste per person by 25%, and promoting the use of recycled materials in new products (Scapini & Berríos, 2021). This long-term vision creates a favorable environment for investment in circularity, incentivizing innovation throughout the entire plastics chain.

In economic terms, the circular economy opens up significant opportunities for both the public and private sectors. At the municipal level, an estimated US\$500 million annually (approximately 20% of local budgets) is allocated to the collection and disposal of household waste, highlighting the high cost of traditional management and the potential savings that greater recovery and recycling would bring (Núñez, 2021). For companies, the opportunities are linked to cost savings through the efficient use of resources, the opening of new sustainable markets, and an improved corporate reputation (Scapini & Berríos, 2021). The growing demand for recycled, reusable, and biodegradable products, as well as the appreciation of indicators such as the carbon footprint, is driving companies to innovate in products and processes.

There are initiatives such as the Ministry of the Environment's Recycling Fund and some private green financing programs that offer financial support to circular projects (Celis, 2024; Agencia de Sustentabilidad y Cambio Climático, w.d.). However, these instruments still need to be strengthened to expand their reach, especially for small and medium-sized businesses, allowing them to scale circular solutions nationwide.

In the technological sphere, Chile presents significant opportunities to strengthen the circular economy in the plastics sector. These include designing products based on recyclability and reusability criteria, which facilitates their reintegration into the production chain and reduces the demand for virgin raw materials (Scapini & Berríos, 2021). The adoption of advanced technologies, such as chemical recycling, automated sorting systems, and the valorization of post-industrial waste, allows not only to increase material recovery rates but also to improve their quality and expand their applications in sectors such as construction, agriculture, mining, and retail (Scapini & Berríos, 2021).

Likewise, packaging return systems offer opportunities to implement reverse logistics models, involving distributors, retailers, and consumers in material recovery and thus strengthening circularity throughout the entire value chain (Celis, 2024). Another relevant area is multisector collaboration. Alliances between companies, universities, technology centers, and startups allow for the development of new, more circular materials and production processes, accelerate knowledge transfer, and promote business models that combine sustainability, efficiency, and added value.

Company perception

The companies surveyed in this study agree that Chile is experiencing a key moment for moving toward a circular economy in the plastics sector, where regulatory changes, market pressures, and social expectations are creating a favorable environment for innovation and transformation.

One cross-cutting opportunity identified is the development of new high-value products from plastic waste, enabling diversified applications in sectors such as mining, energy, construction, retail, and the food industry. Companies such as Revaloriza and Recupac emphasize that, in addition to reducing waste, this allows them to strategically position themselves in markets that value traceability, circularity, and sustainability.

Another aspect mentioned is the opening of new market niches thanks to the growing demand for recycled, compostable, and reusable products. Natural Plas points out that industrial sectors are beginning to prioritize certified circular solutions, generating commercial opportunities that didn't exist before. From the trade union perspective, ASIPLA and AB Chile emphasize that the EPR Law has been a positive catalyst for motivating companies to redesign products, integrate recycled materials, and seek packaging alternatives compatible with recycling systems.

Collaboration appears to be a key opportunity. Several companies see partnerships with universities, technology centers, and startups as a way to accelerate innovation, develop more sustainable materials, and share applied knowledge. Examples such as the agreements between Natural Plas and the University of Concepción or the open innovation spaces promoted by ASIPLA demonstrate the sector's interest in strengthening these networks.

Companies also see value in the opportunity to strengthen their environmental performance through indicators such as carbon footprint, the circular economy, and environmental reporting. According to Ecopolymers and AB Chile, these indicators are increasingly relevant not only to meet regulatory requirements but also to attract investors, industrial clients, and conscious consumers.

Finally, organizations like ASCC emphasize that promoting the circular economy generates economic, social, and environmental benefits nationwide, opening up opportunities for more sustainable business models, creating green jobs, and positioning Chile internationally as a regional benchmark in circularity.

B.2.2 Barriers faced by companies in the transition to the circular economy

Despite the opportunities offered by the circular economy in Chile, there are significant barriers that limit its widespread and sustained adoption by companies. These barriers exist at various levels, affecting everything from public policy design to the daily operations of small, medium-sized, and large businesses.

The infrastructure available for waste collection, sorting, and recycling remains insufficient, mostly concentrated in the Metropolitan Region, while in remote regions, recycling is practically nonexistent due to high transportation and logistics costs (Ladera Sur, 2021). Currently, nearly 82% of household solid waste is deposited in authorized locations, but only 7% of the plastic generated is recycled, reflecting existing limitations (InvestChile & Circula El Plástico, 2021).

In economic terms, municipalities allocate approximately US\$500 million annually to the collection and disposal of household waste, representing around 20% of their budgets, leaving little room for investment in infrastructure (Ladera Sur, 2021). At the private level, companies face high costs associated with process adaptation, technology purchases, and

regulatory compliance, in a context where access to green credit remains limited and at high rates (Celis, 2024; Agencia de Sustentabilidad y Cambio Climático, w.d.).

On a cultural level, myths such as "everything gets mixed up in the trucks" or "recycling is useless" persist, discouraging citizen participation (Ladera Sur, 2021). Furthermore, the perception that recycled products should be cheaper creates pressure on the market, despite the fact that their production is often more expensive due to specialized processes.

Company perception

The information gathered identified specific regulatory and operational barriers affecting the business sector. Each of the barriers identified is detailed below.

Table B.1 Barriers identified from the perspective of companies and organizations

Barrier identified	Detail
Bureaucracy, slowness, and complexity in administrative procedures and permits. (With 7 mentions)	Most companies report that the processes for obtaining permits, health and environmental resolutions, and certifications are excessively long and bureaucratic, generating delays of several years in circular projects and infrastructure investments. This situation discourages innovation and hinders progress towards circularity.
Lack of harmonization and compatibility between regulations (With 2 mentions)	Trade associations such as AB Chile and ASIPLA highlight the coexistence of regulations such as the EPR Law and the Single-Use Plastics Law (PUSU) as a barrier, which generate conflicts in the management of materials such as PET bottles. According to AB Chile, "the coexistence of these two regulations, which were not designed to be compatible and which stress plastic availability, is one of the greatest challenges in waste management." This creates uncertainty about which materials are a priority, how to meet regulatory goals, and what adjustments companies must make to align. Both associations also agree that "the laws are very technical and not everyone understands them (in the case of the EPR or PUSU)," which makes their interpretation and application difficult, especially for SMEs without legal departments or specialists. This reinforces the need to work on harmonizing regulations, clarifying criteria, and strengthening the dissemination of technical content in a manner accessible to all companies in the sector.

Barrier identified	Detail
Lack of infrastructure, plans and institutional support (With 6 mentions)	Companies and associations emphasize that recycling infrastructure in Chile is limited and concentrated in specific regions, leaving much of the country without adequate access. They also point out that the system is not yet prepared to facilitate all circular processes and that a national waste management plan to support businesses is lacking. At the industrial level, there is a lack of space within companies to collect and separate waste and a lack of plants with the technological capacity to process various types of plastics. Added to this are the high logistics costs for collection and transportation, which limit the possibility of generating economies of scale.
Difficulty of understanding and lack of training on the regulations (With 4 mentions)	Companies point out that regulations related to the circular economy are complex and technical, making them difficult to interpret, especially for SMEs without specialized teams. They also identify a lack of internal training in sustainability and compliance, and a low awareness among customers and suppliers of their responsibilities, which affects the effective implementation of legal obligations throughout the value chain.
High costs and lack of economic incentives (With 5 mentions)	Companies highlight the high costs associated with regulatory compliance, including process adaptation, certifications, and technology purchases. They also perceive a lack of clear tax benefits, while recycled products sometimes face higher tax burdens than virgin products.
Insufficient oversight and control (With 2 mentions)	Another aspect identified by companies is the perception of limited oversight by authorities. Controls are considered scarce and their application uneven across the region, generating uncertainty about actual compliance with regulations. This lack of follow-up and monitoring reduces the incentive to advance circular practices, as it is unclear to what extent they are required or how their implementation is verified.
Difficulty in finding certified suppliers and control (With 2 mentions)	The lack of suppliers and certifiers available to meet regulatory requirements is noted, making it difficult to properly close the cycles.

Barrier identified	Detail
Lack of incentives for the use of recycled materials (With 2 mentions)	Another aspect highlighted by companies is the lack of mechanisms that adjust waste management costs based on the recyclability of the materials used. They emphasize the need to establish clear incentives that promote the use of recycled raw materials in plastic products while discouraging the use of virgin raw materials. Companies consider updating regulations a priority to strengthen the recycled plastic market and facilitate compliance with goals such as those established by the EPR Law. They also emphasize the importance of streamlining administrative procedures, such as permits and patents, to unblock processes and allow for the development of new circular solutions and initiatives in the country.

B.2.3 Key players in the transition to the circular economy

Within the framework of the transition toward a circular economy in the plastics sector, various actors play fundamental roles that, in a coordinated manner, enable progress toward sustainable resource management.

a. Industrial sector and trade associations

Private companies and trade associations play an essential role in the transition to a circular economy, leading the production, processing, recycling, and recovery of plastic materials in Chile. The companies surveyed agree that moving toward circular models requires collaborative work between producers, recovery companies, recyclers, waste managers, recycled material suppliers, and customers, highlighting the importance of building strategic alliances throughout the entire value chain.

Among the trade associations interviewed, the Plastics Industries Trade Association (ASIPLA) and the Chilean Food and Beverage Association (AB Chile) play a prominent role in representing their sectors, promoting best practices, fostering training, and actively participating in the implementation of regulations such as the EPR Law.

For their part, companies such as Revaloriza (dedicated to the recovery of industrial waste), Ecopropilenos (specializing in innovative products made from recycled plastics), Reciclapp (focused on digital waste management), Artplas (a producer of plastic materials), and Qactus (a manufacturer of sustainable packaging) highlight the need to strengthen the business ecosystem. In particular, they emphasize the value of collaborating with recycling companies, collectors, and managers of different sizes to comply with regulations, innovate in processes, and scale circular solutions that effectively transform the market.

b. Public sector

The public sector plays a central role in the transition to a circular economy, being responsible for establishing the regulatory framework, defining goals, designing public policies, and ensuring their implementation. The Ministry of the Environment (MMA) is the main player in this area, spearheading key regulations such as the Extended Producer Responsibility Law (REP), the Single-Use Plastics Law, and the Circular Economy Roadmap to 2040. Municipalities, for their part, play a crucial role in local waste management, especially in collection, sorting, and disposal, and are responsible for creating the conditions for national policies to materialize in their territories.

In addition, organizations such as the Sustainability and Climate Change Agency (ASCC) play a key role in developing clean production agreements, promoting waste recovery, generating business support programs, and facilitating opportunities for public-private collaboration.

Based on the perceptions gathered in the surveys, companies agree that the State plays an indispensable role not only as a regulator but also as a facilitator. They emphasize the need for greater institutional support, especially to unblock administrative processes, streamline permits and patents, and support the creation of new companies and innovative solutions. Furthermore, they point out that the State must assume a more active leadership role in expanding infrastructure, strengthening the national waste management system, and creating economic incentives to support the private sector's efforts in circularity.

c. Higher Education Entities

Universities and technology centers play a fundamental role in the transition toward a circular economy, providing scientific knowledge, developing technological solutions, and training professionals in sustainability, waste management, and innovation. The companies surveyed view partnerships between academia and industry as a key opportunity to accelerate innovation processes, improve the efficiency of production systems, and generate applied solutions that address the specific challenges of the sector.

Furthermore, from the perspective of companies, the role of universities is valued not only as research centers, but also as spaces that enable training and awareness among various actors in the value chain, including customers, suppliers, and communities. These partnerships are especially relevant for small and medium-sized businesses that require technical support to interpret regulations, improve processes, and advance the implementation of circular models.

d. Civil society and consumers

Civil society and consumers play an essential role in the transition to a circular economy, as their decisions, behaviors, and awareness levels directly influence the demand for sustainable products and the proper separation and disposal of waste. Consumers are not only end users but also stakeholders who, by changing their consumption habits and

adopting responsible practices, contribute to closing material cycles and driving market change.

According to the surveyed companies, there is still a significant challenge in terms of environmental awareness and education. They point out that many circular initiatives face barriers due to a lack of consumer knowledge or commitment, which limits the impact of efforts made in production and waste management.

Civil society organizations, such as social organizations and NGOs, play a key role in informing, educating, and mobilizing citizens, promoting cultural changes that strengthen the circular economy.

e. Service providers and financial institutions

Specialized service providers and financial institutions play a key complementary role in the circular economy ecosystem. Logistics companies, certification agencies, environmental and technology consulting firms provide technical solutions that enable companies to improve processes, meet sustainability standards, and advance material and waste traceability.

Based on the perceptions gathered in the surveys, it is recognized that having reliable suppliers and certified services is key to advancing circularity. They also identify investors and the financial sector as essential players in enabling investments, highlighting the need for green loans, subsidies, and flexible financing to support the transformation of business models, especially for small and medium-sized enterprises.

B.2.4 Relationship between factors and actors

According to surveys, the interaction between key stakeholders in the circular economy (the State, public agencies, businesses, associations, consumers, academia, recyclers, industrial clients, investors, certifiers, and suppliers) is dynamic, multifaceted, and mediated by cooperation mechanisms, demands, incentives, and structural challenges.

Table B.2 Relationship between factors and actors regarding to circular economy in the Plastic Industry

Key player	How you interact with other actors	Relationship with key factors
State and public bodies	It defines regulations, oversees, provides incentives, finances infrastructure, and collaborates with companies, associations, and academia to design and implement circular policies.	It enables opportunities, regulates barriers, and responds to market and societal demands; its administrative agility and leadership capacity are key to addressing structural challenges.
Companies and associations	They cooperate with recyclers, suppliers, and industrial clients; they participate in trade associations (ASIPLA, AB Chile) to align standards and strengthen sector alliances.	They innovate in response to regulatory and consumer demands; they face costs, incentives, and market pressures; and they depend on infrastructure, financing, and technology transfer.
Consumers and civil society	They demand sustainable products, adopt responsible practices, and pressure companies and authorities; NGOs promote educational and awareness-raising campaigns.	Their demand and behavior are key drivers of regulatory, technological, and market change; they influence the opportunities and challenges of the circular ecosystem.
Academia and research centers	They collaborate with companies and the government in research, innovation, and talent development; they facilitate technology transfer and applied solutions.	They contribute to overcoming technical barriers, developing value-added solutions, and generating knowledge to strengthen the circular economy.
Base recyclers and waste managers	They ensure collection, separation, and traceability; they collaborate with companies, municipalities, and digital platforms (such as Reciclapp).	They are operationally essential for closing material cycles; they require integration, formalization, and access to infrastructure and technology.
Investors and the financial sector	They finance infrastructure, innovation, and scaling; they participate in public-private partnerships and develop instruments such as green loans.	They enable opportunities and circular growth; their accessibility and conditions are crucial for projects, especially for SMEs.

B.2.5 Policies and strategies to strengthen relationships between stakeholders

The surveys conducted highlight that strengthening the relationship between key players in the circular economy in the plastics sector requires concrete and coordinated measures. The main strategies mentioned include:

- Create clear economic incentives, such as tax breaks, subsidies, green loans, and funds for circular projects, especially to support SMEs.
- Develop decentralized infrastructure and improve logistics to facilitate waste management throughout the country.
- Promote educational campaigns aimed at both citizens and the productive sector, and strengthen technical capacities through partnerships with universities.
- Establish clear standards for the mandatory use of recycled materials and differentiated criteria based on the recyclability of products.
- Implement certification and traceability systems that generate confidence in the processes and results of circular initiatives.
- Promote public-private partnership platforms to connect businesses, academia, investors, and the public sector in joint projects.
- Simplify procedures and harmonize regulations to reduce regulatory barriers and boost innovation.
- Facilitate access to competitive financing, including international sources, to scale high-impact solutions.

Rather than generating new, isolated measures, what's needed is to strengthen collaboration, trust, and alignment among strategic actors so that each can contribute, based on their role, to advancing the circular economy in Chile.

B.2.6 Plastic recycling in Chile

In 2023, Chile recycled approximately 7% of its post-consumer plastics, or about 83,679 tons per year, out of a total consumption estimated at between 990,000 and 1,200,000 tons (ASIPLA, 2024). However, PET packaging recycling rates have improved, particularly driven by the EPRLaw.

Chile shares common challenges with other Latin American countries, such as infrastructure deficits, limited environmental education, poor traceability, and problems formalizing recycling systems. However, the 7 The percentage achieved by Chile is above the regional average and reflects some regulatory progress and sector mobilization. While countries such as Mexico and Brazil have made significant investments in recycling, they face similar challenges in terms of oversight and coordination. In this context, Chilean initiatives such as collective management systems, represented by ReSimple, and the creation of "bottle-to-bottle" plants position the country as a pioneer in the region.

Although Chile has made progress thanks to policies such as the EPR Law and the Single-Use Plastics Law, the country still faces significant challenges in scaling up its recycling capacity and aligning with international circularity goals. Strengthening

infrastructure, economic incentives, technological innovation, and environmental education are key factors in transforming plastics recycling into a robust and effective strategy for the country.

B.2.7 Relationship between the Academy and the Plastics Industry at the national level

The analysis of surveys and documents reveals a diversity of relationships between academia and the plastics industry in Chile, especially in areas of recycling and the circular economy. These relationships range from strong strategic alliances to one-off interactions, and reflect both advances and challenges in academic-industry collaboration.

Organizations such as ASIPLA maintain close relationships with universities (e.g., UNAB), holding talks on the circular economy and the EPR Law, promoting training among partners, and establishing cooperation agreements. Natural Plas maintains a four-year partnership with the University of Concepción's University of Technology (UTT), working on proposals for the circular economy and new recycling solutions. RECUPAC, for its part, has an innovation department that connects with universities and startups to seek new solutions and processes.

The AB Chile association (food and beverage sector) collaborates with universities such as PUCV, developing advanced recycling technologies and facilitating knowledge transfer. Companies such as REVALORIZA are advancing waste recovery projects, technology transfer, and technical training through collaborations with universities and technology centers.

Some companies, such as PATIO PARQUE SpA and RECICLAPP, acknowledge unsystematic relationships with universities, limited to consulting, specific projects, or hosting interns. This pattern is also observed in companies such as Ecopropilenos, Recicladados Industriales S.A., Greendot SPA, Qactus, and Comercial LML S.A., which emphasize the need to strengthen these ties to achieve more significant impacts.

This scenario demonstrates that the academic-industry relationship in the plastics sector in Chile is diverse and heterogeneous. While some companies and associations have consolidated alliances to promote innovation and sustainability, many others maintain sporadic ties, which represents a clear opportunity to strengthen collaboration and move toward a more robust and effective circular economy.

B.2.8 Innovations in the plastics industry

The Chilean plastics industry is moving toward circular economy models through various innovations that encompass both product redesign and process transformation. Companies are rethinking their product designs to make them more durable, repairable, or recyclable, incorporating ecodesign and circularity principles from the outset. Furthermore, there is a growing use of post-industrial and post-consumer waste as raw materials for new products, allowing for new value for materials that were previously discarded.

Another relevant aspect is the incorporation of advanced technology, such as recycling plants with automated sorting, washing, and processing systems, which increases the quality of recycled materials and allows for the expansion of production capacity to domestic and international markets. Along with this, new business lines are emerging that apply recycled plastics in sectors such as mining, retail, construction, and industrial footwear, diversifying applications and generating solutions tailored to different industries.

A cross-cutting element that stands out is the increase in partnerships between companies, universities, startups, and public entities, which allow for knowledge sharing, technology development, pilot projects, and capacity building in recycling, reverse logistics, and waste recovery. Together, these innovations reflect a paradigm shift in the Chilean plastics sector, which seeks to move away from the linear model of production, use, and disposal, moving toward a system where resources are optimized, environmental impacts are reduced, and sustainable social and economic value is generated.

Table B.3 Types of innovations in companies and organizations

Innovation Area	Examples of companies
Transformation of waste into new products	Cactus: recycled plastic 3D filaments, sustainable packaging). Artplas Plastics: cross members and components with post-industrial waste. Patio Parque SpA: new products with recycled materials.
Circular economy from design and refurbishment	IKEA: products designed for circularity, repair centers, compostable utensils. Comercial LML S.A.: reconditioning of industrial packaging, circular economy for 20 years.
Technological innovation and advanced infrastructure	Recupac: flexible plastics recycling plant, packaging with recycling. Industrial Recycling S.A.: process automation, export, environmental certifications.

Innovation Area	Examples of companies
New markets and lines of business	Natural Plas: Circular solutions in industrial textiles and footwear for mining, retail, and energy. White Corner SpA: marketing of compostable products after the EPR Law.
Systemic and collaborative innovation	Revalues: improved sorting, reverse logistics, public-private partnerships. AB Chile: “bottle to bottle” plants, eco-design, alliances with universities/startups. ASIPLA and partners: recycled resins, certifications, training, energy efficiency, EPR compliance.

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A.3 Gap analysis for companies and industries – Colombia

C PLASTIC INDUSTRY, BARRIERS AND OPPORTUNITIES: COLOMBIA

C.1 THE PLASTIC INDUSTRY AT NATIONAL LEVEL

C.1.1 Description of the national plastics industry

The plastics sector in Colombia is an integral part of the country's manufacturing industry, characterized by a diversity of companies in terms of size and specialization.

Participation in the Gross Domestic Product (GDP): The Colombian manufacturing industry contributed, on average, 14.4% to national GDP between 2005 and 2023, reaching a peak of 16.7% in 2007 and a low of 12.9% in 2023. Among industrial sectors, the segment that includes the manufacturing of rubber and plastic products represented, on average, 36% of manufacturing GDP during the same period, with a maximum of 39% in 2023. Specifically, the manufacturing of rubber and plastic products contributed on average 2.9% of manufacturing GDP, with 3.5% and 3.2% in 2022 and 2023, respectively. However, its contribution to national GDP showed a decreasing trend, going from a maximum of 0.42% at the beginning of the period to a minimum of 0.31% in 2023 (see Figure C.1).

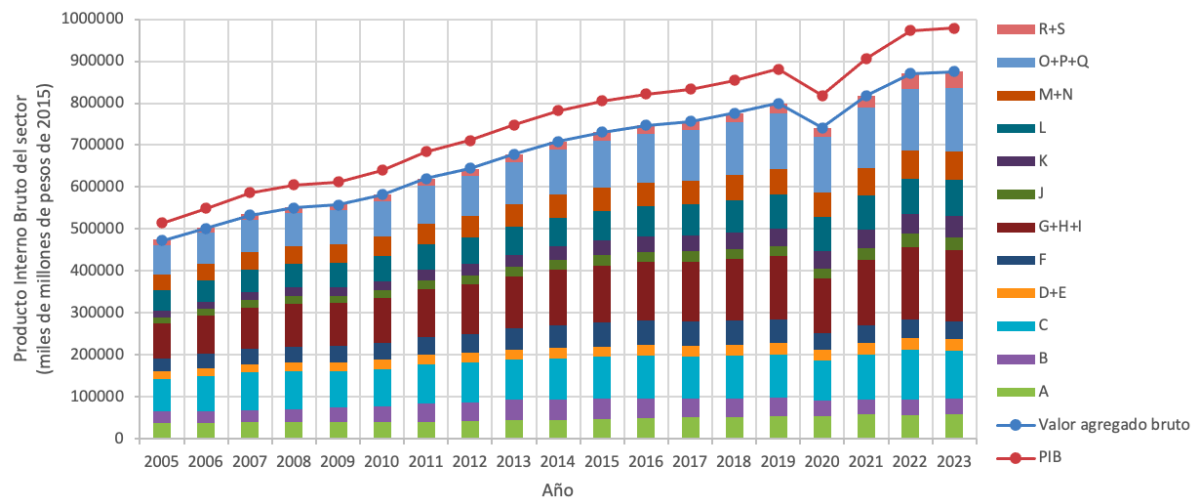


Figure C.1 Gross Domestic Product of the different sections of the International Standard Industrial Classification of all Economic Activities in Colombia for the period 2005 to 2023 at constant 2015 prices. A-Agriculture, livestock, hunting, forestry and fishing B-Mining and quarrying C-Manufacturing industries D+E-Electricity, gas, steam, and air conditioning supply; Water distribution; wastewater disposal and treatment, waste management, and environmental remediation activities F-Construction G+H+I-Wholesale and retail trade; motor vehicle and motorcycle repair; Transportation and warehousing; Accommodation and food services J-Information and communications. Main macroeconomic aggregates 2005–2023p, available at <https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/cuentas-nacionales-anuales>, consulted on March 8, 2025.

Figure C.2 shows the share of C-section divisions in GDP of manufacturing industries. Division C04 (which includes coking, petroleum refining products manufacturing, and fuel blending activities; chemical and pharmaceutical manufacturing; and pharmaceutical botanical manufacturing; manufacturing of rubber and plastic products; manufacturing of other non-metallic mineral products) contributes on average 36% of manufacturing GDP in that period, with a maximum of 39% in 2023. Within the classes of that division, the manufacturing of rubber and plastic products (48 in Figure 3), contributed on average 2.9% of the GDP of section C, with 3.5% and 3.2% in 2022 and 2023. This represents an average contribution of 0.36% to national GDP, with a maximum of 0.42% at the beginning of the period and a minimum of 0.31% in 2023, with a clear tendency towards a decrease in participation in the Colombian economy.

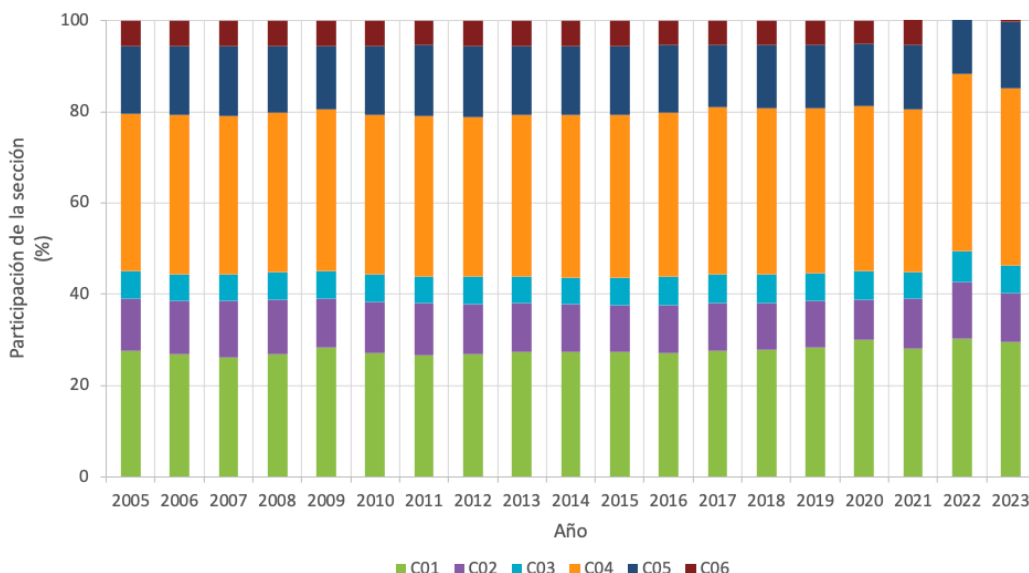


Figure C.2 Gross Domestic Product of the different divisions of section C, manufacturing industries, of the International Standard Industrial Classification of all Economic Activities in Colombia, for the period 2005 to 2023 at constant 2015 prices. C01- Manufacturing of food products; manufacturing of beverages; manufacturing of tobacco products C02- Manufacturing of textile products; manufacturing of clothing; tanning and retanning of leather; manufacturing of footwear; manufacture of travel goods, suitcases, handbags and similar articles, and manufacture of saddlery and harnesses; dressing and dyeing of leather C03- Wood processing and manufacture of wood and cork products, except furniture; manufacture of basketry and wickerwork; manufacture of paper, cardboard and paper and cardboard products; printing activities; production of copies from original recordings C04- Coking, manufacture of refined petroleum products and fuel blending activities; Manufacture of chemical substances and products; manufacture of pharmaceutical products, medicinal chemical substances, and botanical products for pharmaceutical use; manufacture of rubber and plastic products; manufacture of other non-metallic mineral products C05- Manufacture of basic metallurgical products; manufacture of fabricated metal products, except machinery and equipment; manufacture of electrical appliances and equipment; manufacture of computer, electronic, and optical products; manufacture of machinery and equipment n.e.c.; manufacture of motor vehicles, trailers, and semi-trailers; manufacture of other types of transport equipment; specialized installation, maintenance, and repair of machinery and equipment C06- Manufacture of furniture, mattresses, and bed bases; other manufacturing industries. Constructed from data reported in Main Macroeconomic Aggregates 2005–2023p, available at <https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/cuentas-nacionales-anuales>, consulted on March 8, 2025.

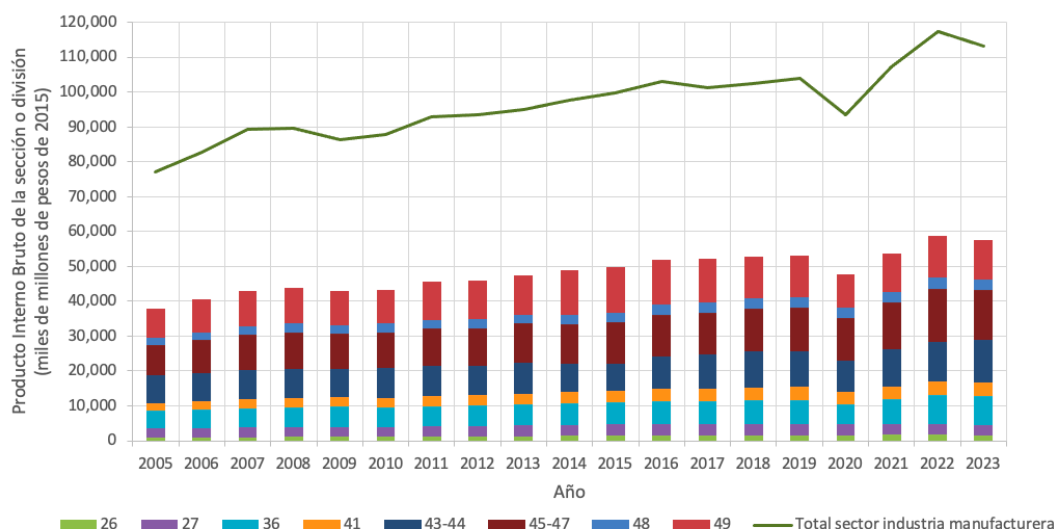


Figure C.3 Gross Domestic Product of some divisions of section C, manufacturing industries, of the International Standard Industrial Classification of all Economic Activities in Colombia, for the period 2005 to 2023 at constant 2015 prices. 26- Manufacture of vegetable and animal oils and fats 27- Manufacture of dairy products 36- Manufacture of beverages (including ice) and manufacture of tobacco products 41- Manufacture of paper, cardboard and paper and cardboard products 43-44- Coking, manufacture of petroleum refining products and fuel blending activities 45-47- Manufacture of basic chemicals, fertilizers and inorganic nitrogen compounds, plastics and synthetic rubber in primary forms; manufacture of other chemical products; manufacture of synthetic and artificial fibers; manufacture of pharmaceuticals, medicinal chemicals and botanical products for pharmaceutical use 48- Manufacture of rubber and plastic products 49- Manufacture of other non-metallic mineral products Constructed from data reported in Main macroeconomic aggregates 2005 – 2023p, available

at <https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/cuentas-nacionales-anuales>, consulted on March 8, 2025.

Number and Type of Companies in the Plastics Sector in Colombia (2007-2022)

Figure C.4 shows the evolution of the number of companies in classes 2013 (Manufacture of plastic products in primary forms), 2221 (Manufacture of basic plastic forms), and 2229 (Manufacture of plastic articles not previously classified) during the period 2007 to 2022. As expected, the largest number of companies, more than 95% in each year of the period, is dedicated to transforming polymers (primary forms) into other products (Superintendencia de Sociedades, 2023). Although the number of companies in these two classes exceeded 518 throughout the period, since 2015 a slight downward trend has been observed, with a 22% reduction in the number of companies (DANE, 2023).

This decline can be attributed to factors such as international competition, a lack of technological innovation, and regulatory pressures related to sustainability and the circular economy (MADS, 2018). Furthermore, microenterprises, which represent the majority of the sector, face significant challenges in terms of access to financing, technology, and broader markets (Superintendencia de Sociedades, 2023).

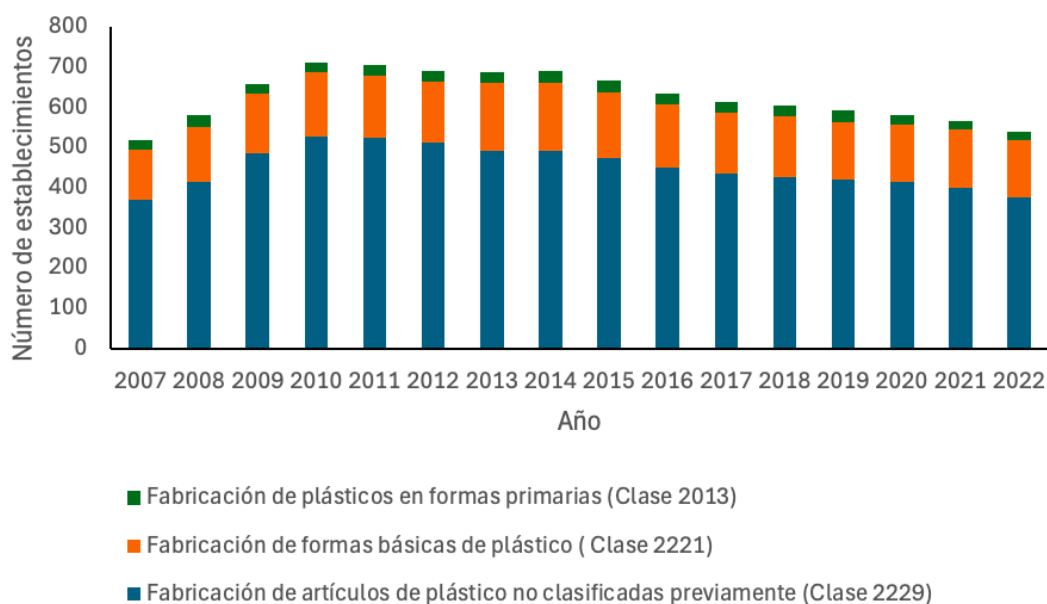


Figure C.4 Number of companies producing plastics in Colombia from 2007 to 2022.

Company Size Distribution in 2024

In Colombia, companies are classified according to their assets in micro, small, medium and large companies. The Figure C.5 presents the distribution of the group's companies 222 of the ISIC (Manufacture of plastic products) in 2024. According to data reported by Acoplastics (2024), 67.9% of these companies are microenterprises, that is, they have assets between 0 and 500 times the current legal minimum wage (SMLV), which by 2024 is equivalent to approximately 300,000 USD. These microenterprises usually operate in low-scale segments, such as the manufacture of bags, containers and plastic products for everyday use (Superintendencia de Sociedades, 2023). On the other hand, large companies represent only the 1.8% of the total, with assets greater than 9 million USD (Acoplásticos, 2024). These companies are leaders in the production of primary plastic forms and in the manufacture of high-tech products, such as components for electronics or aeronautics (DANE, 2023).

Although exact percentages are not specified for the small and medium-sized enterprises, it is estimated that they represent around 20-25% and 5-7% of the sector, respectively (DANE, 2023). The small businesses, with assets between 501 and 30,000 SMV (equivalent to a range of 300,000 to 18 million USD), tend to focus on the production of more specialized plastic items, such as parts for the automotive or construction industries. For their part, medium-sized companies, with assets between 30,001 to 100,000 SMV (equivalent to 18 million to 60 million USD), participate in more structured markets, such as the manufacturing of packaging for the food industry or medical products (Superintendencia de Sociedades, 2023).

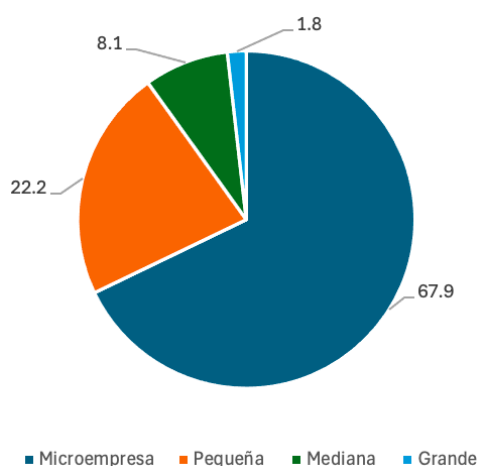


Figure C.5 Percentage distribution of plastics manufacturing companies in Colombia in 2024 according to company size. Constructed from data reported in Acoplásticos (2024).

Main Companies in the Plastics Sector in Colombia

According to the list of the Colombia's 1,000 largest companies in 2023, 20 companies belong to the classes related to the manufacture of plastics, which represents the 2% of the total. This percentage coincides with the contribution of the division C04 (Manufacture of plastic products) al Gross Domestic Product (GDP) national. Among the most notable companies are:

- **Esenttia S.A.:** It ranks 71st in the ranking, with operating revenues of 2,753,078,609 thousand COP (i.e. 668.4 million USD) and profits of 199,483,277 thousand COP (i.e. 48.4 million USD). Esenttia, part of the Ecopetrol Group, with a

majority stake in the Colombian state, specializes in the production of polyethylene (PE) and polypropylene (PP), using monomers produced at the Cartagena refinery (Reficar).

- **Mexichem Resinas Colombia S.A.S.:** It reported revenues of 1,862,829,027 thousand COP (i.e. 452.2 million USD) and profits of 2,318,089 thousand COP (i.e. 0.56 million USD). It specializes in the production and marketing of PVC resins. It primarily produces three types: suspension homopolymers, copolymers, and emulsion resins. Its plant is located in Cartagena (Mexichem, 2025).
- **Ajover Darnel S.A.S.:** It recorded revenues of 1,111,698,241 thousand COP (i.e., 269.9 million USD) and profits of 50,571,504 thousand COP (i.e., 12.3 million USD). The company offers 100% recyclable, compostable, or biodegradable packaging solutions. It offers more than 5,000 packaging references (Darnel, 2025).

The Table C.1 presents the companies on the list of the 1000 largest in Colombia in 2023, classified according to their operating income and belonging to the classes 2013 (Manufacture of plastics in primary forms), 2221 (Manufacture of basic plastic shapes) and 2229 (Manufacture of plastic articles n.e.c.) of the ISIC. These companies represent only the 2% of the list, reflecting the moderate participation of the plastics sector in the national economy.

Table C.1 Companies on the list of the 1000 largest companies in Colombia 2023 according to their operating income, which are part of classes 2013 - Manufacture of plastics in primary forms, 2221 - Manufacture of basic plastic forms and 2229 - Manufacture of plastic articles n.e.c. of the ISIC. Constructed from data published in the Superintendence of Industry and Commerce (2024).

Company name	Region	CIIU class	Operating income		Revenue	
			miles of COP	MUSD	miles of COP	MUSD
ESENTIA S.A.	Atlantic Coast	C2013	2,753,078,609	668.4	199,483,277	48.4
MEXICHEM RESINAS COLOMBIA SAS	Atlantic Coast	C2013	1,862,829,027	452.2	2,318,089	0.6
ADD DARNEL SAS	Bogotá - Cundinamarca	C2229	1,111,698,241	269.9	50,571,504	12.3
TAGHLEEF LATIN AMERICA S.A.	Atlantic Coast	C2221	889,252,272	215.9	-20,905,879	-5.1
DOW CHEMICALS OF COLOMBIA S.A.	Bogotá - Cundinamarca	C2013	873,427,333	212.0	-31,755,658	-7.7

Company name	Region	CIIU class	Operating income		Revenue	
			miles of COP	MUSD	miles of COP	MUSD
MEXICHEM COLOMBIA SAS	Bogotá - Cundinamarca	C2229	859,953,005	208.8	57,150,020	13.9
ESENTTIA MASTERBATCH LTDA	Atlantic Coast	C2013	805,784,476	195.6	203,096,749	49.3
CARVAJAL PACKAGING S.A.	Pacific Coast	C2229	672,090,436	163.2	191,023,907	46.4
AMERICAS STYRENICS DE COLOMBIA LTDA	Bogotá - Cundinamarca	C2013	601,435,324	146.0	19,670,376	4.8
FLEXOSPRING S A S	Bogotá - Cundinamarca	C2229	444,704,708	108.0	20,220,117	4.9
PVC GERFOR S.A.S	Bogotá - Cundinamarca	C2229	426,331,958	103.5	43,569,587	10.6
MULTIIDMENSIONALES S.A.S	Bogotá - Cundinamarca	C2229	424,426,187	103.0	44,501,117	10.8
ALICO SAS BIC	Antioquia	C2229	416,662,584	101.2	31,992,016	7.8
SMI COLOMBIA SAS	Bogotá - Cundinamarca	C2229	396,817,711	96.3	51,381,143	12.5
PLASTILENE SAS	Bogotá - Cundinamarca	C2229	349,563,245	84.9	15,229,575	3.7
TOCANCIPA PACKAGING S.A.S	Bogotá - Cundinamarca	C2229	343,277,831	83.3	63,137,304	15.3
AMCOR HOLDINGS AUSTRALIA PTY LTD SUCURSAL COLOMBIA	Pacific Coast	C2229	335,996,714	81.6	43,482,429	10.6
LITOPLAS S.A.	Atlantic Coast	C2221	307,669,784	74.7	6,515,190	1.6
OBN COLOMBIA SAS	Atlantic Coast	C2221	298,812,627	72.5	-28,306,561	-6.9
MINIPAK S.A.S.	Bogotá - Cundinamarca	C2221	293,723,829	71.3	31,046,504	7.5

C.1.2 Geographical and economic distribution

Figure C.6 presents the distribution of companies in ISIC group 222 across Colombia's departments. Plastics manufacturing companies are present in eight of the 32 departments and the Capital District. 52.1% of the companies are located in the country's capital and Cundinamarca, while 24% and 11.8% are located in Antioquia and Valle del Cauca,

respectively. This behavior is typical of the other classes in the Manufacturing Industries section and coincides with the demographic distribution of Colombia, where the largest percentage of the population is located in the Andean region, with the largest cities being Bogotá, Medellín, and Cali. Figure C.7 presents the distribution of companies in group 222 by metropolitan area, information that confirms what was described in Figure 6; that is, more than 70% of the companies are located in Bogotá and Medellín. Regarding the information in Table 2, 52% of large companies are in Bogotá and 30% on the Atlantic Coast.

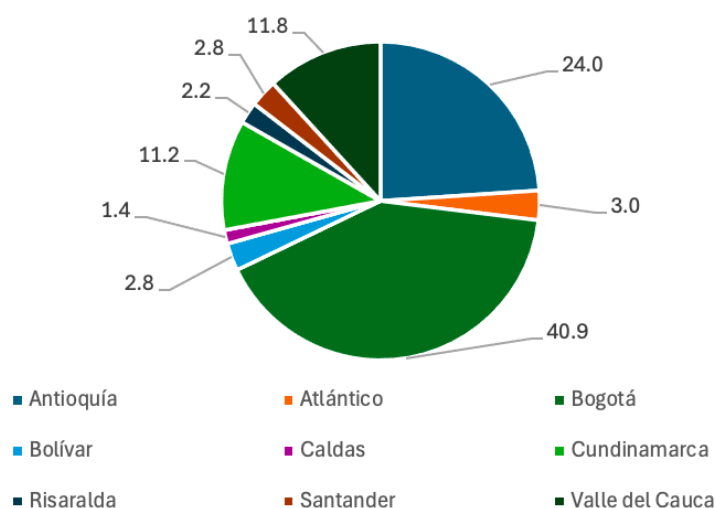


Figure C.6 Percentage distribution of companies in class 222 of the International Standard Industrial Classification of All Economic Activities in the departments of Colombia in 2022. Constructed from the data reported in the Annexes, disaggregation of product and raw material variables of the Annual Manufacturing Survey, available at <https://www.dane.gov.co/index.php/estadisticas-por-tema/industria/encuesta-anual-manufacturera-enam/eam-historicos>, consulted on March 8, 2025.

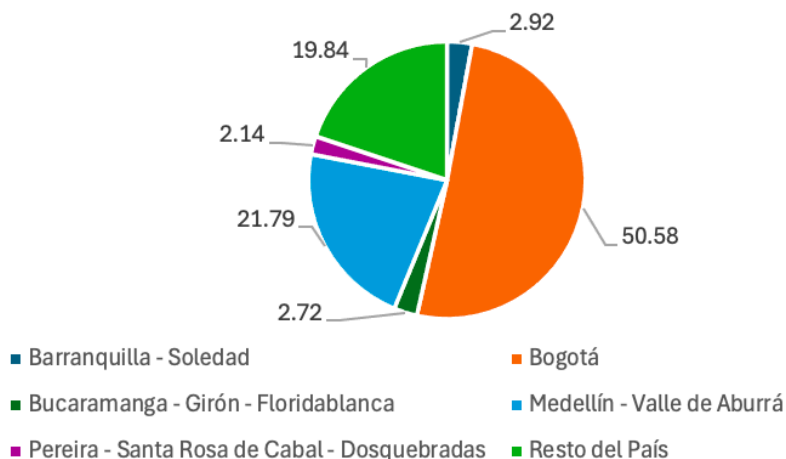


Figure C.7 Distribution of companies in class 222 of the International Standard Industrial Classification of all Economic Activities in the metropolitan areas of Colombia in 2022. Constructed from the data reported in the Annexes, disaggregation of product and raw material variables of the Annual Manufacturing Survey, available

at <https://www.dane.gov.co/index.php/estadisticas-por-tema/industria/encuesta-anual-manufacturera-enam/eam-historicos>, consulted on March 8, 2025.

Considering that information regarding the 2013 class is unavailable, and that they are reported grouped in group 201, the analysis of the geographic distribution of these companies will be based on the information in Table C.1. The largest percentage of companies that manufacture plastics in primary forms, i.e., polymers, are located on the Atlantic Coast (Mamonal industrial area - Cartagena). This region is home to the production plants of Essentia, Essentia Masterbatches, Mexichem Resinas, and Americas Styrenics of Colombia, producers of polyethylene, polypropylene, masterbatches of these polymers, PVC, and polystyrene. This distribution is explained by the ease of access to ship transportation for the import of raw materials required for polymer production or for the export of final products. For example, Ecopetrol's Cartagena refinery (Reficar) produces monomers and has the facility to receive vinyl chloride and styrene on ships from the Caribbean islands or Mexico, or from Southeast Asia via the Panama Canal. Furthermore, the plastic resins produced by Essentia are not only distributed throughout Colombia but also shipped to more than 20 countries, making its location in this geographical area strategic (Essentia, 2025).

C.1.3 Main plastic products in the national market

To determine the polymers most relevant to the domestic market, the production and consumption data reported in the disaggregated Annexes of the product and raw material variables of the Annual Manufacturing Survey for the period 2012 to 2022 for class 2013 of the ISIC were consulted. For the first class, which corresponds to plastic products in primary forms, Tables C.2 and C.3 present the annual production and consumption of products that average over 10,000 tons per year during the aforementioned period.

The most produced polymer is polypropylene (PP), and this production exceeds consumption by approximately 200,000 t (~50%), followed by PVC, whose production also exceeds consumption by a similar amount (~53%). Polystyrene (PS) behaves similarly, with production exceeding consumption, but in this case by approximately 36,000 t (~40%). In the case of polyethylene (PE), which is the most consumed, the behavior is different, since consumption exceeds production by approximately 326,000 t. A particular case is that of polyethylene terephthalate (PET), whose annual consumption is 78,335 t, while production does not exceed 3,000 t (see Figure C.8).

Table C.2 Average annual production for the period 2012 to 2022 of plastics in primary forms (Section C, Division 20, Group 201, Class 2013) in Colombia. Constructed from the data reported in the Annexes, disaggregation of product and raw material variables of the Annual Manufacturing Survey, available at <https://www.dane.gov.co/index.php/estadisticas-por-tema/industria/encuesta-anual-manufacturera-enam/eam-historicos>, consulted on March 8, 2025.

Product	Production (tons)
Polypropylene	407,841
PVC	372,654
Polyolefin resins of polypropylene	130,927
Polystyrene	87,237
Polyethylene	50,208
Acrylic resins	37,147
Copolymers	28,225
polyols (polyalcohols)	20,896
Phenolic resins	19,509
Alkyd resins	19,386
Unsaturated polyester resins	18,601
Vinyl plastic compounds	18,476
Aminoplast resin (urea-formaldehyde)	18,107
Polyester resins	15,537

Table C.3 Average annual consumption for the period 2012 to 2022 of plastics in primary forms (Section C, Division 20, Group 201, Class 2013) in Colombia. Constructed from the data reported in the Annexes, disaggregation of product and raw material variables of the Annual Manufacturing Survey, available at:

<https://www.dane.gov.co/index.php/estadisticas-por-tema/industria/encuesta-anual-manufacturera-enam/eam-historicos>, consulted on March 8, 2025.

Product	Consumption (tons)
Polyethylene	150,769
Polypropylene	78,335
PVC	50,494
PET	36,101
Polystyrene	35,073
polyols (polyalcohols)	33,447
Polyolefin resins of polypropylene	32,521
Acrylic resins	28,060
Polystyrene resins	26,773
Polymers n.c.p.	21,730
Polyester resins	19,630
Vinyl resins	19,234
Copolymers	18,316
Polyurethane	12,398
Aminoplast resin (urea-formaldehyde)	8,296
Alkyd resins	7,233

Figure C.8 reveals significant differences between plastic production and consumption in Colombia, suggesting specific patterns in market supply and demand. Polyethylene and polypropylene show high consumption, indicating their high demand in containers, packaging, and industrial products, while their production is considerably lower, reflecting a dependence on imports. In contrast, PVC production exceeds its consumption, which may be due to its use in sectors such as construction, where demand is stable but less dynamic compared to single-use plastics.

On the other hand, specialized resins such as polyurethane and aminoplast resins have low consumption, possibly due to their use in specific niches with lower market turnover. These differences demonstrate that the structure of the Colombian plastics industry responds not only to domestic demand but also to factors such as the availability of raw materials, installed production capacity, and competitiveness against imports, suggesting

the need to strengthen local production strategies to reduce the sector's vulnerability to external fluctuations.

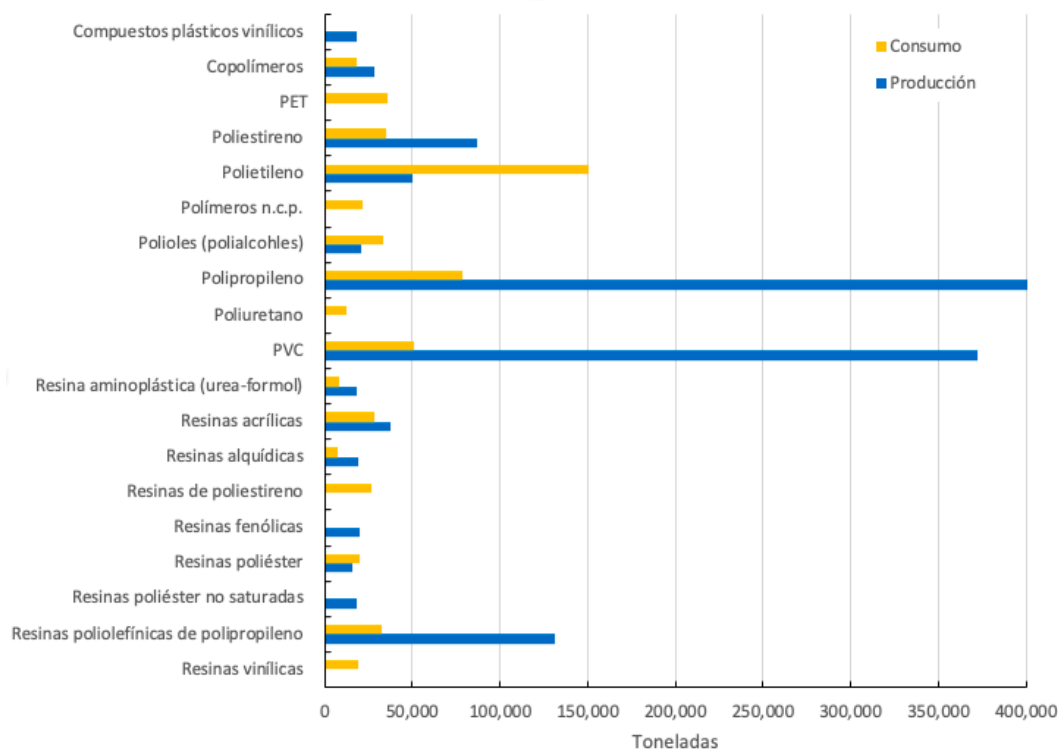


Figure C.8 Average annual production and consumption for the period 2012 to 2022 of plastics in primary forms based on information reported in Table 3 and 4.

In the 2019 Prospective and Benchmarking study conducted by Colombia Productiva, an estimate of the global evolution of plastic production was presented by 2030. This study shows that Colombia will not experience significant changes in production or the market in the coming years. In comparison, China and India will remain the countries with the highest growth, and Germany will increase its production and specialization in high-value-added products (See Figure C.9) (Colombia Productiva, 2019).

So far in the first quarter of 2025, according to Daniel Mitchell, CEO of Acoplásticos, there has been an increase in plastic exports. Despite the crisis in the Colombian plastics industry, the plastics sector saw an 18% increase in exports (in tons and value) compared to 2024. Regarding plastic materials, these are particularly polypropylene and PVC. However, regarding plastic products, exports include pipes, packaging films, caps,

preforms, tableware and kitchen utensils, fabrics, vinyl, among others. This demonstrates the diversification of the export market (Portafolio, 2025).

C.1.4 Main applications of plastic at the local level

To determine the most relevant end uses in the domestic market, we consulted the production and consumption data reported in the Product and Raw Material Variables Breakdown Annexes of the Annual Manufacturing Survey (EAM) for the period 2012 to 2022 for ISIC classes 2221 and 2229. Tables C.4 and C.5 show the average production and consumption of basic forms of plastic and previously unclassified plastics (Section C, Division 22, Group 222, Classes 2221 and 2229) for the period 2012 to 2022. According to the data, the most consumed basic forms of plastic in Colombia are containers, bags, sacks, and films. The most produced and consumed basic form of plastic in Colombia is plastic containers of 1L and larger. For this product, the units consumed are more than those produced by more than 62%. Nearly 50% of the sector is comprised of packaging used for rice, detergents, shampoo, soap, dairy products, dry grains, snacks, and other foods. More durable plastics include those used in construction, pipes, tiles, tanks, containers, profiles, and ceilings, among others (Portafolio, 2025).

Table C.4 Average annual production for the period 2012 to 2022 of basic plastic shapes and plastic products not previously classified (Section C, Division 22, Group 222, Classes 2221 and 2229) in Colombia. CConstructed from the data reported in the Annexes, disaggregation of product and raw material variables of the Annual Manufacturing Survey, available at <https://www.dane.gov.co/index.php/estadisticas-por-tema/industria/encuesta-anual-manufacturera-enam/eam-historicos>, consulted on March 8, 2025.

Product	Units	Production
Plastic container of 1000 cm3 and more	units	723,825,023
Synthetic material packaging bags	units	225,406,962
Polyvinyl pipes	kg	122,070,087
Unprinted plastic bags	kg	76,591,371
Printed plastic bags	kg	65,060,898
Decorative and artistic figures made of plastic material	units	61,977,873
Polyethylene film	kg	61,548,799
Articles n.e.c. of plastic material for household use	units	56,327,880
Plastic caps and plugs	kg	37,163,496
Printed plastic tubular film	kg	36,461,435
Plastic plumbing fittings	units	27,535,224
Promotional items made of plastic material	units	26,110,537
Polypropylene film	kg	25,656,771
Unprinted plastic tubular film	kg	24,561,234

Product	Units	Production
Polyvinyl fittings for pipes and other plastic materials	kg	21,484,494
Laminated film of plastic materials	kg	20,547,577
Plastic articles and accessories for agriculture	units	20,327,667

Table C.5 Average annual consumption for the period 2012 to 2022 of basic forms of plastic and plastic products not previously classified (Section C, Division 22, Group 222, Classes 2221 and 2229) in Colombia. Constructed from the data reported in the Annexes, disaggregation of product and raw material variables of the Annual Manufacturing Survey, available at <https://www.dane.gov.co/index.php/estadisticas-por-tema/industria/encuesta-anual-manufacturera-enam/eam-historicos>, consulted on March 8, 2025.

Product	Units	Consumption
Plastic container of 1000 cm3 and more	units	1,214,193,547
Plastic containers of less than 1000 cm3	units	767,382,318
Plastic caps and plugs	kg	613,781,095
Printed plastic bags	kg	329,871,155
Synthetic material packaging bags	units	241,998,069
Unprinted plastic bags	kg	155,629,472
Printed plastic tubular film	kg	79,761,955
Laminated film of plastic materials	kg	72,321,285
Plastic packaging for drugs and cosmetics	units	68,876,225
Polyethylene film	kg	68,770,090
Plastic casings for sausages	kg	52,167,884
Polypropylene film	kg	42,884,733
Self-adhesive tape	kg	38,734,095
Packaging material n.e.c. of rigid foamed plastic	kg	37,734,898
Plastic hose couplings and nozzles	units	33,567,151
Plastic hoses	m	28,708,786
Plastic material screen	m	27,647,867
Parts and accessories for plastic caps and plugs	thousands	25,084,821

C.1.5 Which segments of the plastics production chain have the greatest potential for adopting circular economy models?

According to the National Circular Economy Strategy (ENEC) (MADS - MinComercio, 2019), Colombia prioritizes six lines of action as the axes of the CE implementation strategy. Within these lines, the one of flows of packaging materials, is directly related to the purpose of this project. The use of packaging materials is concentrated in sectors such as food, beverages, pharmaceuticals, and cosmetics.

The main materials used to make containers and packaging worldwide and in Colombia are plastic, paper, and cardboard. Another line related to the project is the construction

material stream, composed of clay, cement, wood, plastics, glass, gypsum, and other materials (which corresponds to 22 Mt/year). This is a priority stream in terms of sector growth and the area requirements for final disposal, although the contribution of plastics to this type of waste is not significant.

Regarding the first line of action (packaging materials), which would be the priority within the framework of the project, according to EC's strategy, to take advantage of this flow of materials it is necessary to implement:

- (i) Eco-design, toward packaging that is more efficient in its use of materials while maintaining its functionality, and using materials with a lower impact throughout its entire life cycle.
- (ii) Industrial symbiosis between business clients who constantly exchange materials that maintain their value in the chain.
- (iii) Regulatory harmonization, which incorporates responsibilities and economic instruments that encourage the use and closure of cycles, such as the limitation or prohibition of final disposal.
- (iv) Economic instruments, such as deposit-refund systems or usage fees, that change the rationale for disposal.
- (v) The articulation of the public sanitation service system with the extended responsibility of the producer, including the providers of the utilization activity
- (vi) The potential for its energy use.

Furthermore, on November 21, 2023, the National Government, industry, universities and research centers, non-governmental organizations, and professional recycling associations joined forces in the Pact for the Reduction and Substitution of Plastics and Single-Use Items, promoted by the Ministry of Environment and Sustainable Development. This Pact aims to combine efforts to promote environmental sustainability for single-use plastic products in the country through the implementation of strategies such as ecodesign, eco-labeling, strengthening of value chains, social inclusion, training, awareness-raising, responsible consumption, and civic culture. Among the commitments contemplated in this pact are (i) the strengthening of the value chain through collaboration between actors in the plastics production and value chain, (ii) the development of strategies to implement the Extended Producer Responsibility (EPR) for containers and packaging, particularly for single-use plastics, which has been in force since 2018, and (iii) the training and

strengthening of professional recyclers in the plastics value chain. According to Acoplásticos:

“The pact establishes concrete commitments focused on strategies and investments vital to sustainable development. For example, it promotes the exploration of innovative financing mechanisms, such as investment funds for the circular economy, tax incentives to promote the implementation of sustainable practices in plastics management, and financing programs for entrepreneurship. It also seeks to incentivize projects that seek innovative solutions to reduce the generation of plastic waste, its leakage into the environment, and promote its recycling, as well as the promotion and encouragement of research, development, and innovation (R&D&I) into sustainable alternatives for plastics.” (Acoplásticos, 2023).

Thus, considering the plastics sector value chain shown in Figure 9, the value chain segments that have the greatest potential to implement circular economy strategies are:

- (i) The production of plastics in primary and basic forms. This takes into account that Colombia has implemented extended producer responsibility for containers and packaging for food and beverages, including their caps, since 2009 (Resolution 1407 of 2018, amended by Resolution 1342 of 2020 of the Ministry of Environment and Sustainable Development).
- (ii) The consumption of final products, which is the link where the flow of materials that can be incorporated into the EC is generated.
- (iii) The recovery of usable materials.
- (iv) The transformation of usable materials.



Figure C.9 Simplified representation of the plastics sector value chain. (Own elaboration)

C.2 KEY FACTORS AND ACTORS IN THE TRANSITION TOWARDS THE CIRCULAR ECONOMY

C.2.1 Opportunities to promote the circular economy in the plastics sector

The ENEC (Ministry of Environment and Sustainable Development; Ministry of Commerce, Industry and Tourism, 2019) prioritizes six lines of action as the axes of the EC implementation strategy in Colombia, and one of these lines, that of packaging and container material flows, is directly related to the objective of this project.

On the other hand, the National Plan for the Sustainable Management of Single-Use Plastics (Ministry of Environment and Sustainable Development, 2021) sets the following goals:

By 2025 at least 25% (by weight) of the following single-use plastic products will be effectively recycled: (i) Containers used to pack or package meals and food prepared on-site, for takeout or consumption, including products made of expanded polystyrene (Styrofoam). (ii) Plates, trays, knives, forks, spoons, and glasses.

For 2030:

- **100% of single-use plastics placed on the market will be reusable, recyclable, or compostable.** All single-use plastic products placed on the market, which are technically permitted and determined by the government, have a **minimum average content of 30% recycled material**.
- **At least 50% (in tons) of the following single-use plastic products are effectively recycled** Containers used to pack or package meals and food prepared on-site, for takeout or consumption, including products made of expanded polystyrene (Styrofoam). Plates, trays, knives, forks, spoons, and cups.

According to data reported by the EAM (Economic and Environmental Management), for the period 2012 to 2022, an average of 1.28 Mt of plastics in primary forms were produced in Colombia, and around 1.4 Mt in 2021 and 2022. During the same period, an average of 0.76 Mt of these same plastics were consumed. Regarding basic forms of plastic, it is

more difficult to make an estimate since production and consumption data are presented in different units (units, thousands, kg, m, etc.). However, organizations such as the WWF estimate that 0.7 Mt of plastic containers and packaging are generated annually, of which only 30% is used in the production of new plastics (WWF, 2024). For its part, Greenpeace estimates a consumption of 1.25 Mt of plastics based on a per capita consumption of 24 kg per year. Of this consumption, 76% ends up in landfills, and 54% is single-use plastics. The Ministry of Environment and Sustainable Development reports that Colombia recycles 163,000 tons of plastic materials per year, and that Bogotá and Medellín process 13,000 tons of plastic waste per month. This has been achieved thanks to the work of professional recyclers and the network of nearly 260 processing industries. In 2019, the Single Information System for Household Services identified that 15.1% of the recycled materials, or 212,434 tons, correspond to plastics.

Finally, the Plastics Sector Business Plan – Vision 2032 It establishes that "an excellent articulation between academia, the public sector and the private sector is necessary to pave the way for innovation in the development of additives and biomasses for the production of plastics with recycled or biodegradable resins, or recycled products (chairs, containers, packaging, bricks, etc.) or high added value for export in order to reach new markets such as Canada, Panama, El Salvador, France and Germany to boost production and employability of the Plastics sector in the long term" (Colombia productiva, 2019).

The same Colombia Productiva report presents a diagram of the impact and uncertainty for industrial development in Colombia. It shows an industry in transition, where uncertainty stems from the intersection of regulation, innovation, and the productive structure. To mitigate risks and capitalize on opportunities, policies are required that balance economic incentives with environmental restrictions, encouraging the adoption of new technologies and strengthening the formalization of the sector. Thus, taking into account the country's policies, plans, and strategies for CE and single-use plastics, there is a significant opportunity to promote CE in the plastics sector.

In summary, key economic and infrastructure opportunities are identified that can drive the advancement of the circular economy in the Colombian plastics sector:

- **Growing regulatory and government support:** There is consensus on the fundamental role of policies such as the ENEC (National Environmental Protection Agency), Law 2232 of 2022, and Decree 1076 of 2015, which provide a solid legal framework for promoting the circular economy through tax incentives and access to financing.
- **Opportunities in recycling infrastructure:** The expansion of waste management infrastructure is recognized as a priority, generating opportunities for investment in technology and process optimization (Resolution 1342 of 2020; Rodrigo-Illarri et al., 2021).
- **Generation of green jobs:** The potential of the circular economy to open new business opportunities and promote job creation in areas such as recycling, eco-design, and waste management is highlighted (Law 2232 of 2022; CONPES 3874, 2016).

Diverging views emerge regarding the scope of public and private investment, the emphasis on technological innovation and cultural change, and the differentiated focus on large companies and SMEs:

- **Scope of public and private investment:** Some authors (Ministry of Environment, 2021; Ellen MacArthur Foundation) emphasize that public investment is crucial for the transition. Others (Ortiz et al., 2022; Jiménez et al., 2019) highlight the importance of attracting private capital through tax incentives.
- **Emphasis on technological innovation and cultural change:** While authors such as Vera-Acevedo and Raufflet (2022) underline the need to invest in advanced technologies, others (Rodrigo-Illarri et al., 2021) prioritize strengthening the culture of recycling and community cooperation.
- **Differentiated focus on large companies and SMEs:** Some documents (Acoplásticos, 2023; Cifuentes et al., 2021) focus on how large companies can lead the change, while others (Ministry of Environment, 2021) highlight the need to support informal recyclers and small businesses.

The Colombian plastics sector has a promising economic and financial outlook for moving toward a circular economy. Growing access to financing and economic incentives, both nationally and internationally, facilitates investment in sustainable technologies and

practices. The development of new sustainable business models, such as eco-design and reverse logistics, opens up opportunities for innovation and value creation. Attracting foreign investment, especially in recycling infrastructure, drives the modernization of the sector and the adoption of advanced technologies.

Furthermore, the expansion of markets for recycled and biodegradable products fosters demand for sustainable materials and strengthens the circular economy. These opportunities, combined with strategic management and effective collaboration among key stakeholders, position the Colombian plastics sector to lead the transition toward a prosperous and sustainable circular economy.

Additionally, other key aspects for the advancement of the circular economy in the Colombian plastics sector:

- **Development of clean technologies and more efficient processes:** There is widespread consensus on the crucial importance of developing new clean technologies, such as chemical recycling, automated quality control, and advanced materials separation, to improve the sector's efficiency and reduce its environmental impact (WRAP; Ellen MacArthur Foundation; Department for the Environment, 2021).
- **Digital platforms for waste traceability:** Documents such as CONPES 3874 (2016) and ENEC (2019) highlight the need to implement digital systems to track the flow of recyclable materials and optimize waste management (Rodrigo-Illarri et al., 2021; Recycling for Peace Program).
- **Expansion of the market for biodegradable products:** Law 2232 of 2022 and Decree 1076 of 2015 promote the development and commercialization of compostable and preferably biobased packaging, which creates an opportunity for companies to invest in technologies that replace traditional single-use plastics (Chicas Sierra & Arias Ver, 2022; Ministry of Environment, 2022).

However, there are differing views regarding the speed of technological adoption, the efficiency of economic incentives, and the focus on emerging technologies versus traditional solutions:

- **Speed of technological adoption:** Ortiz et al. (2022) argue that innovation in ecodesign and modular production is advancing rapidly thanks to public-private

collaboration. In contrast, Rodrigo-Illarri et al. (2021) argue that the lack of infrastructure in rural areas significantly limits the adoption of circular technologies.

- **Efficiency of economic incentives:** According to González (2021), government incentives are essential for the circular transition. However, Vera-Acevedo & Raufflet (2022) warn that these incentives are not always well structured or accessible to SMEs.
- **Focus on emerging technologies or traditional solutions:** Cifuentes et al. (2021) prioritize investment in emerging technologies such as chemical recycling and artificial intelligence. On the other hand, Hernández et al. (2017) suggest that traditional solutions, such as optimizing existing processes, still have significant potential for improvement.

On the other hand, according to Daniel Mitchell, CEO of Acoplásticos, the Colombian plastics sector has invested approximately \$150 million over the last four years exclusively to increase installed plastics recycling capacity. In summary, this adds up to an additional 90,000 tons of capacity, for a total of between 400,000 and 500,000 tons (Portafolio, 2025).

In conclusion, the Colombian plastics sector has significant potential to advance toward a circular economy through the adoption of innovative technologies. The momentum in research, innovation, and development (R&D), along with the strengthening of strategic alliances, creates an enabling environment for the adoption of advanced technologies such as chemical recycling and Industry 4.0. Furthermore, access to financing and support programs, backed by key regulations, facilitates investment in circular technologies. Digitalization and waste traceability improve waste management efficiency, enabling the large-scale implementation of circular solutions. To seize these opportunities, it is critical that the Colombian plastics sector continue to invest in innovation, strengthen alliances, and leverage available support programs.

B.2.2 Barriers faced by companies in the transition to the circular economy

In 2023, the National Association of Manufacturers (ANDI) conducted the study "Recyclability Potential of Packaging in Colombia," identifying the weaknesses and barriers

of each group of flexible and rigid plastics (ANDI, 2024). The most relevant results are presented below:

“For the use of flexible plastics to be profitable, collection and storage must be optimized so that the collected weight occupies a significant load on the road and, subsequently, in the warehouse. Furthermore, due to the weight-volume relationship, these materials present a barrier to transport because managers prioritize the collection of other heavier materials. However, these barriers are not unique to Colombia. Likewise, the stakeholders consulted mentioned that the lack of regulatory incentives affects the use of flexible plastics and that the implementation of regulations plays a crucial role in creating markets and stimulating innovation, given that the challenge for these materials is to improve their recyclability and efficiency without compromising their high standards of functionality and durability” (ANDI, 2024).

“For rigid plastics, the most significant barriers center on quality and price, compared to virgin materials. Additionally, some identified factors that are important because they can be a limiting factor when utilizing and marketing different rigid materials include component design, the use of color tones, material incompatibility, lack of identification, and production conditions” (ANDI, 2024).

However, innovation is vital to the success and survival of SMEs. These companies often face difficulties due to a lack of resources and experience in developing and implementing innovative management systems (National Planning Department - DNP, 2016). Many SMEs fail to fully leverage the benefits of innovation, which limits their growth and competitiveness. The 2018-2022 Development Plan report highlights the limited technological availability and lack of digital inclusion among Colombian SMEs. Only 1% use advanced robotics technologies, and 9% turn to the Internet of Things. Despite efforts implemented in policies to promote innovation in Colombia (DNP, 2019), SMEs lack a solid understanding of how their operations impact the Sustainable Development Goals (SDGs). Often, their actions focus on charity rather than adopting a strategic vision that recognizes the medium and long-term risks and opportunities that these effects can generate (Arango, 2018, p. 101)

According to Khalid et al. (2023), it is questionable whether SMEs can balance environmental and economic objectives. It is argued that, due to resource constraints,

SMEs often face difficulties in developing sustainability capabilities, which can generate additional costs and hinder their competitiveness. Furthermore, SMEs often struggle to capitalize on green business opportunities due to a lack of necessary skills. However, empirical studies suggest that SMEs can develop the organizational capabilities to achieve both economic and environmental objectives. A better understanding of these challenges, opportunities, and strategies that SMEs can employ to maintain their competitiveness and achieve sustainability objectives is crucial, and further research is needed. It is also necessary to study how innovation promotion instruments or strategies can contribute to SMEs achieving sustainability objectives and how they can be articulated with the SDGs.

On the other hand, in a study on progress in the implementation of circular economy business models in Colombia, González et al. (2025) found three major barriers: Insufficient infrastructure for the collection and recycling of materials in many regions of the country, predominance of linear business models and resistance on the part of companies to move towards circularity, and lack of knowledge of consumers and companies about the circular economy.

In another direction, in a thesis of the Environmental Engineering program at the Central University developed within the framework of the present TechTraPlastiCE project, Dayana Luque Avendaño (2025) carried out an analysis of factors that influence the transition of the Colombian plastics sector towards the circular economy, considering the economic, technological, political-legal, environmental and sociocultural dimensions. The study advances a systematic literature review of 58 documents including scientific articles, documents from governmental and union entities, regulations and policies, identifies gaps and drivers for the circular economy in the sector, and proposes strategies to Correct (weaknesses), Confront (threats), Maintain (strengths) and Exploit (opportunities), summarized with the acronym CAME. Table C.6 summarizes the main findings of the thesis.

Table C.6 Gaps, drivers, and strategic proposals by dimension (economic, technological, political-legal, environmental, and sociocultural). Source: Luque Avendaño (2025), pp. 56-58.

Dimension	Key gaps	Key drivers	CAME Strategies
Economic financial	High dependence on imported raw materials. Difficulties in accessing financing (especially SMEs). Inadequate tax incentives.	Export growth of 15.6% (2024). Increase in investments (US\$150 M). Alliances such as GoPlastic and A2censo.	Correct incentives and improve access to credit. Addressing volatility and diversifying recycled products. Maintain investment in machinery. Exploit international markets and demand for sustainable products.
Technological	Low R&D capacity. Poor recycling infrastructure. Technological gap between SMEs and large companies. Weak adoption of ecodesign.	Investments in advanced recycling. Use of 4.0 technologies. Alliances with universities and innovation centers.	Correct by promoting R&D and technology centers. Facing with technical training. Maintain current investments. Exploit alliances and new technologies in automation and traceability.
Political legal	Fragmented regulations and weak implementation. Slow procedures. Exclusion of informal recyclers. Lack of inter-institutional harmonization.	Recent laws (2232/2022, 2277/2022). Pact for Plastics. International participation (COP26, SDGs).	Correct regulatory weaknesses. Addressing lack of harmonization with effective coordination. Maintain public-private pacts and alliances. Exploiting the legal framework as a lever for innovation and eco-design.
Environmental	Low recycling rate. High waste generation. Insufficient infrastructure. Critical environmental impact of unrecovered waste.	Law 2232 and EC goals. Alliances like Vision 30/30. Growing public interest. Potential international financing.	Correcting data and knowledge gaps. Tackling informality and fragmentation. Maintain investments in recycling plants. Exploit regulations and alliances to access international resources and increase waste recovery.

Dimension	Key gaps	Key drivers	CAME Strategies
Sociocultural	Low level of environmental culture. Weak citizen participation. Stigmatization of informal recycling. Poor business training.	Educational campaigns (Give Life to Plastic). Pact for Plastics. Institutional and academic alliances.	Correct with continuing education programs. Addressing cultural barriers with community leaders. Maintain successful campaigns. Leverage collaborative networks to spread circular values in schools, businesses, and communities.

Barriers and opportunities from the perspective of sector actors

To gain a broad and accurate perspective of the companies in the sector, a survey was conducted with relevant questions about barriers and potential opportunities. The form used is presented in Annex I, which was shared via email and social media with members of the Bogotá Chamber of Commerce (CCB) Printing and Packaging Cluster and Acoplásticos associates. Additionally, interviews were conducted with key industry and academic stakeholders using a semi-structured interview guide presented in Annex II. The interviews were audio-recorded, but not video-recorded, and despite the semi-structured interview guide, interviewers had the option of including questions or continuing the thread proposed by the interviewee based on their initial responses.

Regarding the survey forms, responses were obtained from companies of different sizes, with a greater representation of large companies (see Figure 10). The main economic activities and products of these companies include: plastics manufacturing; manufacturing of primary plastics; manufacturing of flexible packaging; manufacturing of inks and pigments; manufacturing of colors and additives; manufacturing of food packaging; management of plastic from waste electrical and electronic equipment; production of raw materials and compostable products; marketing of plastic raw materials for injection, extrusion, and blow molding.

When it comes to these companies' plastic products and applications, there's a wide variety: raw materials such as polypropylene, polyethylene, and recycled polypropylene; flexible packaging; varnishes and adhesives; inks for flexographic and rotogravure printing; organic and inorganic pigments, pearlescent pigments, and aluminum used in masterbatch manufacturing; liquid colors and additives for the plastics industry in general; plastic containers and lids for the cosmetics, pharmaceutical, personal care, and industrial sectors; food packaging for industrial clients (dairy, margarine, and confectionery) and restaurant chains.

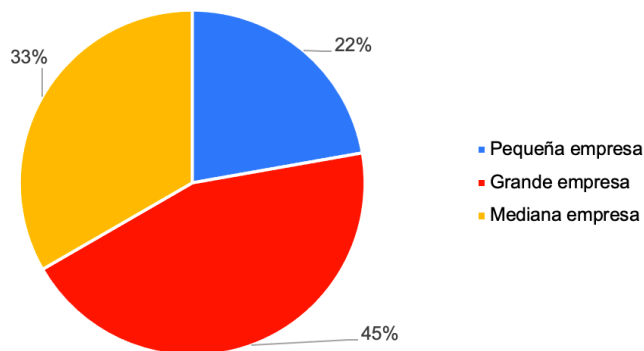


Figure C.10 Size of companies that responded to the survey form.

The surveyed companies are located on the Atlantic Coast, Bogotá-Cundinamarca, Cali and Medellín, with a higher percentage of companies in the Bogotá-Cundinamarca region (see Figure C.11), which was expected, since it is the region where the largest number of companies in the sector are located.

■ Barranquilla
 ■ Bogotá D.C.
 ■ Cali
 ■ Cartagena
 ■ Medellín
 ■ Mosquera
 ■ Soacha
 ■ Tocancipá
 ■ Yumbo

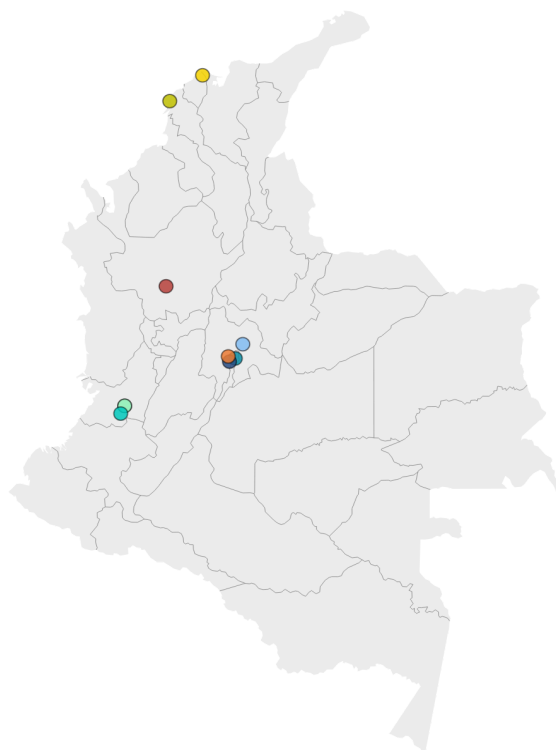


Figure C.11 Location of the companies that responded to the survey.

Regarding the interviews, the actors belong to different organizations, which are listed below:

- Acoplásticos: Daniel Mitchell Restrepo - Executive President; Jenny Paola Ruje Roncancio - Technical Director; Paola Ocampo Seferian - Executive Vice President.
- Plastics and Rubber Training and Research Institute (ICIPC): Laura Fernanda Flórez Sastre - General Director.
- University of Antioquia (Circular Alliance): Pablo Andrés Maya Duque - Professor and Research Director of the Circular Alliance.
- National University of Colombia - Bogotá Campus: Óscar Javier Suárez Medina - Chemical Engineer and professor.

The responses from the various stakeholders and companies were structured into four relevant categories. The main findings related to these categories are presented below:

- **Compliance with legislation**
 - Business support strategies

In its business support strategies, Acoplásticos acts as a mediator between industry and government regarding regulations issued by the latter. This mediation seeks to balance sustainability and economic growth, promoting synergies between companies and the government to comply with circular economy regulations. Its role also includes facilitating the communication of opportunities, such as calls for MSMEs, providing technical support for implementing sustainable practices, and facilitating the adoption of sustainable standards through programs such as Operation Clean Sweep and recyclability labels. Additionally, it participates in national working groups (e.g., the National Plastics Roundtable) and supports companies in submitting projects to access funding from calls for proposals.

A key factor in supporting companies is the implementation of best practices, such as carbon footprint measurement and recycled content certification, to align them with regulations such as Extended Producer Responsibility (EPR) and the Single-Use Plastics Law. According to Paola Ocampo, Acoplásticos supports companies by disseminating regulations, offering clear technical information on how to comply with the Single-Use Plastics Law and Extended Producer Responsibility (EPR). It conducts training sessions, webinars, and produces educational materials such as infographics to clarify obligations and reduce confusion. It organizes sessions with member companies and their clients to explain regulations, such as the plastics tax and recycled raw material usage targets, helping to align the industry with regulations.

For its part, the ICIPC supports companies through injection molding training, ONAC-accredited certification of recycled plastic content, and the generation of technical

information to help them comply with Extended Producer Responsibility (EPR) and the Single-Use Plastics Law. According to Laura Florez, the Institute offers companies certifications that allow them to participate in tax exemptions and offer products made with recycled plastic on the market.

The National University, through technical roundtables and projects with municipalities and recycling associations, supports companies in waste management, promoting technical solutions and training to comply with regulations. Professor Óscar Suárez has participated firsthand in projects with municipalities to evaluate waste management proposals, providing technical analysis and recommendations for process improvements.

The Circular Alliance project supports companies in waste management under the Extended Producer Responsibility (EPR) framework. It also conducts workshops and interviews to identify sector needs.

However, according to the companies surveyed, various strategies have been adopted to comply with environmental legislation, particularly in the plastics sector and the circular economy. Esenttia, for example, has developed source separation programs and a certified recycled resin plant, while Intecplast participates in groups such as Acoplásticos and has implemented circular economy diagnostics. Others, such as Empaques Transparentes and Carvajal Empaques, have focused their efforts on social awareness campaigns, portfolio changes, and participation in sector projects. Meanwhile, Avient, a company with an international presence, stands out for offering its clients innovative solutions to help them comply with regulations.

World Compost and Grupo Plásticos de Colombia also demonstrate significant actions, such as participating in awareness-raising events and registering on REP transformation platforms. However, some companies, such as OCADE, request greater visibility and institutional support. Technical support for clients, the incorporation of eco-design criteria, and investment in clean technologies are also common strategies for companies like Sun Chemical, reinforcing their commitment to regulatory compliance from a systemic perspective.

- Adaptation actions for regulatory compliance

For its part, Acoplásticos promotes the incorporation of post-consumer recycled materials and the use of methodologies such as life cycle assessment (LCA) to comply with regulations like Law 2232. It encourages eco-design and certifications (recycled content seals) to align companies with the regulations. It works with the Ministry of the Environment to include clear concepts of circularity in regulations, such as those required for the use of recycled plastic in bags, although its action is limited to providing information and presenting technological and scientific arguments. It advocates a proactive approach to regulatory development, using technical arguments and data to avoid prohibitive regulations and promote viable solutions. It has been actively involved in regulatory

development since 2016, providing technical arguments to avoid excessive prohibitions and promote viable regulations.

Laura Flórez highlighted the work of ICIPC, which participates in technical roundtables with the Ministry of the Environment to provide technical input and improve regulations. Its collaboration with Acoplásticos and the Ministry itself is being established to clarify regulations, such as biodegradation standards and certifications. For its part, the National University participates in technical roundtables (Senar, RedSEC, Conaza) to adjust regulations and guarantee their technical viability. Its technical approach ensures that regulations are practical, correcting errors in initial proposals and promoting extended producer responsibility (EPR).

Companies are implementing concrete measures to align with regulations. For example, Sun Chemical is developing internal plans such as "Zero Waste," energy consumption controls, and efficient technologies. Empaques Transparentes already manufactures packaging with 100% PCR, while Esenttia operates a recycling plant and is developing chemical recycling pilots. Intecplast has adapted its process with three-layer dies that allow the use of PCR, and Carvajal Empaques has migrated its materials and substrates to align with sustainable requirements.

OECD applies a specialized strategy by separating plastics with hazardous contaminants and sending them to certified compost bins, while World Compost is developing a comprehensive plan to reduce misinformation. In all cases, there is a trend toward adjusting production processes, implementing traceability, and focusing on specific compliance, such as that of the REP or Law 2232. However, adaptation remains uneven, and many actions are driven more by business leadership than by robust policies.

- Barriers

Some of the barriers identified by Acoplásticos, according to Paola Ruje, include the difficulty for MSMEs to adopt modern technologies and the complexity of reverse logistics in remote regions, which makes it difficult to comply with regulations. The structure of the sector (mostly MSMEs) and the lack of financial incentives also limit compliance. Daniel Mitchell, on the other hand, commented that barriers include the complexity of designing sustainable products without compromising functionality or costs, the difficulty of incorporating recycled materials due to their variable properties, and a cleaning system geared toward landfill disposal (85% of waste in Colombia ends up in landfills). He also highlights logistical challenges in collecting recyclable materials.

Paola Ocampo stated that the main barriers are regulatory uncertainty due to regulatory delays, a lack of clarity in standards, and the absence of tools for industrial reconversion. She also highlighted greenwashing, a lack of oversight by authorities, and the cultural resistance of business leaders to sharing information. The delay in regulations (e.g., until June 2024 for a standard expected in December 2023) has generated chaos, and the lack

of response from companies (only 20 of 3,000 surveyed) hampered reconversion plans. According to her, the main barriers are the lack of regulatory disclosure, the absence of oversight bodies, the shortage of recycled materials for SMEs, and the poor technical drafting of the Single-Use Plastics Law. She also mentioned the lack of clarity in biodegradation standards and the cultural resistance of some companies.

For his part, Oscar Suárez stated that the main barriers are the lack of reliable data on waste composition, the absence of infrastructure for differentiated collection, and the lack of citizen education. He also highlights the ineffectiveness of regulations without adequate collection systems. The lack of precise characterization of plastics and the mixing of waste in compacting trucks hinder regulatory compliance. Meanwhile, Maya mentioned that the barriers are associated with the lack of regulations for reuse and refill models, the reluctance of companies to participate in studies for fear of legal consequences, and the difficulty of transferring technological tools due to bureaucratic restrictions and lack of trust. Uncertainty about the legality of certain models and the lack of clarity in the transfer of tools from universities to the private sector are significant obstacles.

The most common barriers cited by companies include a lack of regulatory clarity, weak implementation, and limited government support. Companies such as Intecplast and World Compost believe that existing regulations lack sufficient guidelines, while Sun Chemical and Esenttia criticize the lack of instruments promoting the use of non-PET recycled resins. Lack of knowledge about the value chain and high implementation costs, as is the case with ecodesign, are also common challenges.

Another recurring obstacle is the disconnect between the actors in the chain: recyclers, brands, converters, and consumers, which hinders coordinated action. Additionally, smaller companies such as OCADE and Grupo Plásticos de Colombia cite a lack of financial and technological resources as a major obstacle. This situation creates a gap in adaptability, especially for medium-sized or specialized companies, which require greater government support to comply with legal requirements.

- Benefits

Regulatory compliance drives innovation, opens new lines of business, and improves competitiveness by aligning with sustainability standards and differentiating itself in the market. For example, regulations such as Law 2232 allow companies to develop sustainable products, such as 100% recycled bags, that meet environmental standards and maintain functionality. Colombia leads Latin America in chemical recycling and plastics regulation, positioning the sector as a benchmark. According to Daniel Mitchell, "Colombia is currently the only country in Latin America that is already practicing chemical recycling." Investments in mechanical recycling (more than \$150 million over three to four years) and regulations have accelerated the transition to circularity, generating economic and environmental benefits.

The REP has generated valuable information and driven industry change, promoting recycling and the formalization of the value chain. ICIPC certifications allow companies to access tax exemptions and maintain their market presence. Legislation promotes circularity and recycling, especially in PET, although the benefits are more accessible to large companies. Additionally, the REP has made it possible to hold producers and importers accountable, reducing public health risks and fostering more structured management systems. Regulations have driven changes in sectors such as light bulbs, with energy and environmental benefits. The transition to technologies such as LEDs shows how regulations can drive innovations that facilitate recycling and reduce costs, a move that could also occur in the plastics sector.

Complying with current legislation has become not only an obligation but also a competitive advantage for many companies. Esentia and Sun Chemical highlight benefits such as avoiding sanctions, maintaining their operating licenses, and improving their brand positioning. They also mention indirect economic advantages, such as access to more demanding markets, third-party recognition, and building customer trust. Intecplast reports environmental and fiscal benefits, such as tax exemptions.

Even for smaller companies or those with a diverse focus, such as OCADE, compliance is an opportunity for visibility and access to new markets. Companies generally recognize that adopting regulations not only allows them to compete on a more level playing field, but also strengthens their sustainability principles, as is the case at World Compost. In short, regulatory compliance represents a strategic tool for positioning themselves in an increasingly demanding regulatory environment.

- Measures implemented to comply with single-use plastic guidelines or Extended Producer Responsibility (EPR) compliance

Acoplásticos promotes measures such as the use of post-consumer recycled materials, the promotion of eco-design, and the strengthening of reverse logistics. For the REP, it emphasizes the need to improve the availability of recyclable materials and formalize professional recyclers. For example, it implements initiatives such as Operation Clean Sweep to prevent plastic pellet leaks, recyclability and recycled content seals, and projects to incorporate recycled plastic in applications such as asphalt mixes. For example, projects such as Emplázate (recycling in market squares) and partnerships with recyclers in regions such as San Andrés and La Guajira support the achievement of REP goals. Furthermore, Acoplásticos implements intensive training (such as talks every three days after a law goes into effect) and produces educational materials.

The National University has worked on post-consumer regulations for pesticide containers, promoting their controlled incineration due to contamination. It also supports the training of recyclers for source segregation.

Among the concrete measures established by companies are the use of recycled plastics (PCR), product redesign, and investment in cleaner processes. Empaques Transparentes leads the way with the manufacture of 100% PCR-certified packaging. Esenttia promotes REP and has a 100% certified recycled resin plant. Intecplast reuses scrap and adopts eco-design practices. Sun Chemical has developed product portfolios that comply with sustainability principles and has established strict monitoring of resource consumption.

For their part, companies like OCADE are adapting their processes through specialized WEEE management, ensuring the safe disposal of contaminants and responsible recycling. Grupo Plásticos de Colombia works with collected waste, although it states that it still needs more information to strengthen its implementation. Companies thus show varying degrees of progress in complying with the guidelines, with a common focus on reducing, reusing, and recycling, although structural challenges persist.

- **Innovation (barriers and opportunities)**

- Barriers to innovation

According to Ruje, the main barriers are the lack of R&D areas in MSMEs, the use of obsolete equipment, a short-term mindset focused on immediate productivity, and a scarcity of financial incentives. MSMEs lack the resources to invest in R&D, and obsolete equipment limits their ability to implement innovative processes. The disconnect between academia and industry, along with the complexity of incorporating recycled materials, are additional obstacles. Paola Ocampo commented that the absence of government incentives, the complexity of sanitary regulations for products in contact with food, and limited laboratory capacity in Colombia hinder innovation. Furthermore, the lack of digitalization in the plastics industry and the absence of continuous improvement departments in companies are key barriers. She also highlights the lack of control over plastic marking and the low quality of recycled materials. According to Paola Flórez, manual waste sorting and the lack of standardization in marking hinder innovation in recycling.

Oscar Suarez mentioned that the lack of waste classification, cultural resistance to segregation due to the lack of a solid proposal from government agencies, and the absence of infrastructure for differentiated collection are key barriers. He also highlighted the lack of trust between industry and academia, and the reliance on short-term solutions. Maya asserts that the lack of regulations for models such as refilling, companies' reluctance to participate in studies, and bureaucratic restrictions on technology transfer are key barriers.

The main barriers identified by companies to innovating in sustainable practices include high costs, limited infrastructure, and weak coordination between stakeholders. Companies such as Sun Chemical emphasize that ecodesign still represents a higher cost compared to conventional solutions. Intecplast cites the lack of clear guidelines in

legislation, which impedes the more agile development of sustainable products. Furthermore, many companies, such as Esenttia and World Compost, point to the lack of financial incentives as a major obstacle to investment in innovation.

Additionally, there are barriers associated with business culture and a lack of technical information. Avient states that the market is unwilling to pay more for sustainable products, which discourages their development. Carvajal Empaques and OCADE also highlight limitations such as the lack of specialized recycling infrastructure and the limited resources available for innovation, especially in small and medium-sized companies. In general, it is observed that the barriers are not only technical, but also regulatory, financial, and cultural.

- Opportunities for innovation

Innovation offers opportunities for new business lines, such as recycled or compostable products, and the development of sustainable applications. Regulation drives the creation of value-added products. Examples such as Enka (PET recycling) and Natura (refill system) show how innovation can transform the sector. Market differentiation through sustainable products is a significant opportunity. Maya presents the development of minimum viable products (such as water filters with flexible plastics), digital tools for decision-making, and controlled pilots to test reuse and returnability models as opportunities.

Despite the barriers, companies recognize multiple opportunities to innovate in sustainability. For example, Esenttia has identified the development of new circular businesses as a concrete possibility, while Sun Chemical and Carvajal Empaques are migrating their portfolios toward more sustainable solutions, such as redesigned packaging or the use of PCR. These opportunities are especially linked to growing market demand and the desire to remain competitive.

Furthermore, companies like World Compost highlighted that the market is increasingly demanding in terms of environmental solutions, creating an opportunity to position themselves as pioneers. Intecplast is taking advantage of these opportunities through practices like eco-design, while Avient is orienting its product offering to facilitate the recycling, reduction, and reuse of plastics. Opportunities appear to be concentrated in the integration of recycled materials, product redesign, and the adoption of clean technologies.

- Ongoing or implemented projects

Acoplásticos has supported projects such as the replacement of glass fibers with natural fibers with the Jorge Tadeo Lozano University and studies on the recycling ecosystem with the Piloto University. It also participates in projects with Colombia Productiva to incorporate recycled materials. Currently, a project with Colombia Productiva supports 40 companies, including some in the plastics sector, in ecodesign and the use of post-consumer recycled resin. It promotes projects such as the use of recycled plastic in asphalt mixtures (with

Invías), solutions for the cement sector, and the strengthening of recyclers in regions such as Ciénaga, Nuquí, and San Andrés. It also promotes recyclability seals and campaigns such as Emplázate (Emplazate). Furthermore, Acoplásticos participates in projects such as a composting pilot project with companies and the German cooperation agency (GIZ), and promotes the Observatory of Technologies and Information for the Circular Economy (Plas-TIC) to generate quality information.

Oscar Suárez stated that the National University has worked on waste characterization projects with recyclers and process optimization in sectors such as floriculture. Escamilla participated in a returnable waste pilot with the company Ciclo and the Mayor's Office of Medellín, using German cooperation funds. It has also developed digital tools, booklets, and virtual courses on the circular economy.

Several companies reported concrete progress in innovation projects. Esentia is developing a plastic resin identifier and a pilot program for chemical recycling using pyrolysis. Empaques Transparentes has been recognized as the first company endorsed by ANLA (National Association of Laboratories) for 100% PCR packaging and is participating in the EnCadena project. Sun Chemical has implemented a portfolio of sustainable products and adopted energy efficiency measures such as partial solar energy operation and CO₂ emission control.

For its part, Intecplast has invested in technologies such as three-layer die-cutting heads and eco-design developments, while OCADE is working on the reconditioning of electronic equipment and the separation of contaminated plastics. Carvajal Empaques is implementing initiatives with social impact for professional recyclers. Even World Compost is designing a clear and understandable legal plan for its compostable solutions. In all cases, a practical and technical focus of innovation, linked to legal compliance and sustainability, is emphasized.

- Business support strategies

Some strategies are supported by the coordination of different actors in the plastics value chain. Acoplásticos acts as a facilitator, connecting companies with resources, promoting training in energy efficiency and processes, and facilitating certifications for recycled products. It also offers technical assistance and encourages the adoption of simple tools, such as data measurement, to improve processes. ICIPC organizes open innovation challenges, calls for entrepreneurs, and events to connect supply and demand for recycled materials. It facilitates the connection between recyclers and processing companies and promotes the formalization of the recycling market. The National University offers training to recyclers and technical advice to companies to optimize processes and reduce waste.

According to companies, internal and external support strategies are varied and, in many cases, insufficient. Companies such as Sun Chemical and Esentia report having developed partnerships with universities or other stakeholders in the supply chain to

promote innovation projects. Others, such as Empaques Transparentes, opt for educational and social outreach campaigns and collaborative projects with centers like the ICIPC. However, many companies still require more structured support from the State, in the form of financial incentives, technical training, and clear regulations.

Avient, for example, highlights the importance of communication between brands and processors to understand common challenges, while Grupo Plásticos de Colombia calls for more up-to-date information and financial support. It is recognized that the role of the State, academia, and business associations is fundamental, but still insufficiently coordinated. Therefore, strengthening support networks is critical to accelerating circular innovation in the sector.

- **Transition to the circular economy**

- Opportunities to adopt EC practices

Opportunities include new lines of business and certifications that generate consumer confidence. Regulations promote sustainable alternatives. Examples mentioned above, such as Cristal and Natura, highlight the potential of circularity. The development of sustainable products with recycled materials, market differentiation through certifications, and the creation of new markets are also opportunities. Flórez stated that the transition to circularity is driven by the use of PCR, eco-design, and improved waste management. REP groups and ICIPC research facilitate the incorporation of recycled materials into new products. Packaging, which consumes 50% of plastics, is key to closing the loop, with opportunities in monomaterials and chemical recycling.

Companies identify significant opportunities to accelerate the adoption of circular economy practices, especially related to process improvement, product redesign, and access to new markets. Carvajal Empaques cites the shift toward sustainable models and innovation in raw materials as key opportunities. Esenttia and Sun Chemical agree that complying with these principles is not only an environmental necessity but also a competitive advantage in the market.

World Compost sees an opportunity in positioning itself as a unique option in the face of the growing demand for compostable solutions, while Intecplast has identified benefits in recirculating materials and adopting more sustainable technologies. OECD sees the potential to strengthen its production chain if its best practices are disseminated and recognized. These opportunities are anchored in both regulatory pressures and market dynamics, and suggest that the transition to a circular economy is viable if resources and stakeholders are properly coordinated.

- Weaknesses or barriers

The weaknesses are similar to those mentioned in the barriers to innovation. Additionally, there are limitations in reverse logistics (especially in remote regions) and a lack of public awareness about waste disposal. The negative perception of plastic and a lack of resources for innovation are significant obstacles. Acoplásticos identified the barriers to innovation as a landfill-oriented cleaning system, logistical challenges in collecting recyclable materials, and the difficulty for MSMEs to innovate due to limited resources. Flexible packaging and products in contact with food present additional challenges due to food safety requirements. According to Mitchell, "the raw materials for recycling are generated in absolutely every home in Colombia, so logistics are much more complex."

Additionally, there is a lack of citizen awareness about waste separation, a shortage of recycled materials for SMEs, and misinformation about biodegradation. Suarez asserts that a lack of citizen education, the absence of separate collection, and citizen disappointment at seeing mixed waste are significant barriers. The lack of reliable data also limits planning. The mixing of waste in compaction trucks and the lack of infrastructure discourage citizens, hindering circularity.

Among the main weaknesses identified by companies in this transition are the lack of recycling infrastructure, limited availability of food-grade recycled materials, and a lack of clear guidelines for implementing legislation. Carvajal Empaques, for example, highlights that the recycling chain is weak and that available recycled materials do not meet standards for certain uses. Esentia and Sun Chemical indicate that incentives and regulatory frameworks are needed to promote the incorporation of non-PET resins.

The lack of financial resources, as in the case of OCADE and Grupo Plásticos de Colombia, also hinders progress in this transition. World Compost identifies fear and misinformation about compostable products as barriers. In general, greater institutional and educational coordination is needed to enable companies to adopt sustainable and circular economy practices more clearly, efficiently, and profitably.

- Key players for companies in the transition

The key stakeholders are the government (for regulations and resources), academia (for R&D), professional recyclers (for reverse logistics), and consumers (to change perceptions and habits). According to Ruje, "Further formalizing recyclers, I think that has to be almost like sponsoring them." Multi-stakeholder collaboration is essential, with Acoplásticos playing a role as a liaison between these groups.

Companies agree that the transition to a circular economy is only possible with the coordinated participation of multiple stakeholders. They particularly highlight the State, ministries, recyclers, cleaning companies, end-user brands, processors, and suppliers of recycled raw materials. Companies such as Esentia and Sun Chemical identify the entire value chain as key, which includes not only the State but also consumers and academia.

Intecplast and Carvajal Empaques highlight the role of the Ministry of the Environment and PCR suppliers as key players. OECD mentions the importance of having responsible companies that properly dispose of their waste, and World Compost emphasizes that manufacturers and customers must have a common vision. This multiplicity of actors reflects the need for shared governance to achieve sustainable and systematic progress.

- Business support strategies

Acoplásticos provides support through training, technical support, promotion of calls for proposals, and certifications. It offers digital tools to collect data and improve processes. Some projects, such as Colombia Productiva, offer technical assistance to companies to incorporate recycled materials and optimize processes. ICIPC offers training, certifications, and technical sheets for recycled materials. It promotes awareness among users and companies about separation and eco-design. According to Óscar Suárez, training recyclers, optimizing industrial processes, and developing waste generation maps for management planning can be strategies to support industries.

The support received by companies has been mixed, and many express the need to strengthen it. Some, such as Esenttia and Empaques Transparentes, have created their own internal strategies or collaborated on public-private initiatives. Carvajal Empaques and World Compost are developing sustainable schemes based on material and product innovation, but are seeking greater institutional support. Grupo Plásticos de Colombia emphasizes the importance of receiving financing and technical advice.

OECD, for its part, has worked with international organizations such as GIZ and the United Nations, which has allowed it to formalize processes for hazardous waste management. Even so, many companies state that current support is insufficient and that incentives should be better distributed to encompass both large, medium-sized, and small businesses. This suggests the need to strengthen public policy, cooperation, and technical financing mechanisms.

- Solutions or improvements implemented in your company

Companies have implemented various solutions to improve their environmental performance and transition toward a circular economy. Intecplast has adopted eco-design, the use of three-layer dies, and life-cycle analysis. Sun Chemical has increased its investment in technology and improved resource consumption tracking and CO₂ control. Carvajal Empaques has worked on material changes, recycling projects, and the use of food-grade PCR.

Empaques Transparentes leads the way with 100% PCR packaging, while Esenttia promotes chemical recycling and 100% recycled resins. OCADE contributes with its WEEE separation model and safe disposal of brominated plastics. World Compost has developed compostable designs internally, and Avient offers products that facilitate reduction, reuse,

and recycling. Together, these solutions reflect a growing commitment from the sector, although many initiatives still require greater scalability.

- **Relations with Universities**

- Types of relationships

On the Acoplásticos side, the relationship includes joint projects, technical training, and participation in calls for proposals. However, collaboration is limited and requires more structure, such as applied theses or long-term projects. The organization acts as a bridge, but resource limitations and a lack of clear mechanisms hinder deeper collaboration. The Plastics and Rubber Training and Research Institute has served as a bridge, focusing on ecodesign and energy efficiency, but academia tends to conduct research that is largely unimplemented. The lack of connection is due to the perception that academia produces utopian research, while companies seek practical solutions. The ICIPC welcomes students for internships and collaborates on projects, but academia focuses on long-term research, while industry seeks immediate solutions.

The relationship between the National University and the external sector is good when there is direct collaboration, but it is limited by mutual misgivings and a lack of trust. The university offers technical solutions, but industry does not always take advantage of them. Collaboration occurs on specific projects, but there is no structured relationship. Large companies (Nutresa or Enka, for example) have established relationships with specific universities (such as EAFIT and the University of Antioquia), but SMEs have less contact due to a lack of resources and time. The university faces bureaucratic barriers to technology transfer. Relationships with large companies are more fluid, but with SMEs they are limited and require greater effort.

The level of engagement with universities and research centers is uneven, according to company responses (see Figure C.12). Some, such as Esentia, Empaques Transparentes, and both Sun Chemical locations, have established clear links through innovation projects, academic events, and university internships. These collaborations allow for the development of sustainability-aligned solutions and the training of technical personnel in circular economy issues. In these cases, academia plays an active role in supporting business transformation processes.

In contrast, companies such as Avient, Intecplast, Carvajal Empaques, and Grupo Plásticos de Colombia do not report any current links with universities. This reveals a gap in the coordination between the productive and academic sectors, which could be limiting the capacity for innovation and adaptation. Collaboration channels need to be strengthened to leverage applied research in the development of circular solutions.

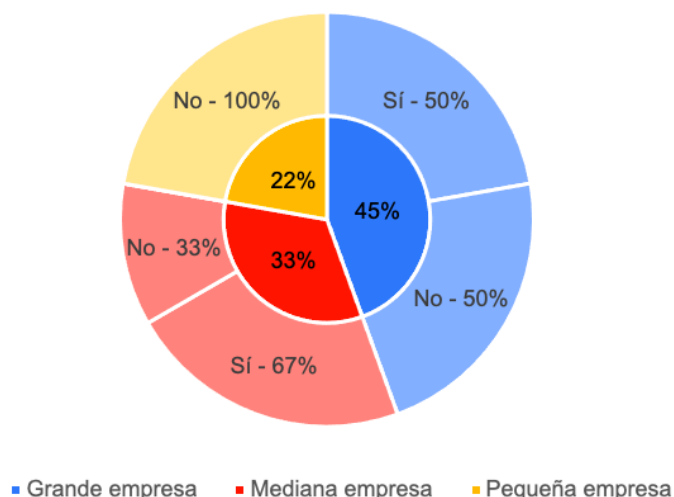


Figure C.12 Percentage of companies that reported having some type of relationship with academia, according to their classification, for companies that responded to the survey.

- Examples of projects or collaborations

Acoplásticos is working on specific projects, including the replacement of glass fibers with natural fibers (Jorge Tadeo University) and studies on the recycling ecosystem (Pilot University). These projects are in their infancy but show potential for addressing industry-specific problems. Some examples include collaborations with the National University of the Andes and EAFIT through the ICIPC, focused on training, research in polymers and biomaterials, and the development of sustainable solutions. The projects focus on sustainability and the circular economy, but are primarily led by the Institute, not through direct relationships between companies and universities.

From the Circular Alliance, some projects include a returnable pilot with Ciclo and the Medellín City Hall, the development of a water filter using flexible plastics (initially with Nutresa), and digital tools for logistics and traceability. These collaborations involve external resources and master's degree students.

Among the most notable examples of corporate responses is the EnCadena Transparent Packaging project, in collaboration with ICIPC and Colombia Productiva. Esentia has also worked with universities on innovation exercises for their sustainability initiatives, while Sun Chemical has actively participated in academic events and training programs. These experiences demonstrate how collaboration can translate into concrete results such as new products, waste identification, and sustainable action plans.

World Compost also mentions that it works with academia, developing plans under the law to dispel misinformation about compostable products. In contrast, companies such as Grupo Plásticos de Colombia, OCADE, and Carvajal Empaques do not report specific

projects, although in some cases they collaborate with institutional actors such as the United Nations or ministries. This suggests that there is still great potential to be tapped in terms of collaborative research.

C.2.3 Key players in the transition to the circular economy

The key players in the circular plastics economy are:

- i) The national government, through agencies such as the National Planning Department, CONPES, the Ministry of Environment and Sustainable Development, the Ministry of Commerce, Industry and Tourism, the Ministry of Science, Technology and Innovation, the Superintendency of Public Services, etc., responsible for promulgating policies, approving and regulating laws, and implementing them, will make it possible to achieve the goals proposed in the ENEC.
- ii) Companies producing plastics in primary and basic forms are responsible for their plastic products through ecodesign and Extended Producer Responsibility.
- iii) Municipal governments and local legislative bodies responsible for providing sanitation and waste collection services must implement policies and issue decrees that facilitate the incorporation of recyclable plastic waste into the EC.
- iv) Garbage collection companies are responsible for collecting recyclable plastics.
- v) Recycling associations play a fundamental role in the country's collection of recyclable plastic waste. In some cases, these associations create an intangible link between consumers and companies that can recycle plastic waste.
- vi) Consumers, who through appropriate product selection, responsible use, and proper disposal, will facilitate the segregation and incorporation of plastic waste into the EC.
- vii) Companies that recycle plastic waste, as it is at the heart of their economic activity.
- viii) Plastics industry associations, especially ANDI, Acoplásticos, sector development clusters of chambers of commerce (for example, the packaging and printing cluster, the water and circular economy cluster in Bogotá), and even the National Chamber of Plastics, are acting as facilitators of relations between companies, the national government, and legislative bodies at the municipal and national levels.

- ix) Multi-stakeholder public-private alliances aimed at articulating efforts in the circular economy, such as Bogotá Circular Region (Bogotá Circular Region, 2024), ANDI Circular Vision (ANDI, 2025i).
- x) Oversight institutions and environmental NGOs must monitor and audit the results of the implementation of the ENEC.
- xi) Universities and research institutes, generating the knowledge and technologies necessary for the use of plastics through CE, or facilitating the adaptation of acquired technologies by companies.
- xii) Primary and secondary education institutions, training young people in a CE culture.
- xiii) International entities that promote the circular economy, such as the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (giz, 2025).

C.2.4 Relationship between factors and actors

The interaction of stakeholders in the circular economy in Colombia is complex and depends on several regulatory, economic, technological, and social factors. Five main groups of stakeholders can be identified:

The State (National and Local Government)

- It regulates the production, use, and disposal of plastics through regulations such as Law 2232 of 2022, which establishes goals for the reduction of single-use plastics.
- It promotes circular economy policies, such as the National Circular Economy Strategy (ENEC), and coordinates incentives for recycling and sustainable production through the Ministry of Environment and Sustainable Development, the Ministry of Commerce, Industry and Tourism, and the National Planning Department.
- Implements programs to formalize recyclers and improve infrastructure for source separation.

Companies and Industrial Sector

- Major companies such as Enka of Colombia, Esenttia, Postobón, and Mexichem Resinas have developed recycling and sustainable production models.
- Industries must implement Extended Producer Responsibility (EPR), as is the case with Grupos Retorna and RecoPET, which work on the recovery of post-consumer plastic packaging.
- Others have opted for compostable, bio-based materials and new mechanical and chemical recycling technologies.

Recyclers (or waste pickers) and Recycling Cooperatives

- They are key to the plastic waste recovery chain and represent more than 60,000 professional recyclers in the country.
- Cooperatives such as ARB (Bogotá Recyclers Association) and Cooperativa Planeta Verde have formalized their operations and are working with businesses and the government to improve recycling efficiency.
- However, they still face challenges such as a lack of job recognition, informality, and a lack of access to technologies that could increase their cost-effectiveness, especially due to technical and financial deficiencies.

Academia and Research Institutions

- Universities such as the National University of Colombia have developed projects in recycling and biodegradable materials in partnership with companies and the government.
- The Central University and other institutions have worked to include recyclers in circular economy models and environmental education strategies.
- Research programs have been created in new materials, waste management efficiency, and energy recovery.

Consumers and Civil Society

- Consumer behavior is a critical factor in the circular economy, as recycling and source separation depend on environmental education and awareness.
- Movements such as Bogotá Basura Cero and Greenpeace Colombia have promoted campaigns against single-use plastics and sustainable alternatives.

The implementation of circular economy in Colombia depends on a balance between clear regulations, economic incentives, and technological advancements. Although investment in machinery for the plastics industry is increasing, it is essential that this growth be aligned with sustainable production models. Furthermore, digitalization and cross-sector collaboration can accelerate the adoption of circular practices.

ANDn an initial analysis of the influences between actors and factors mentioned in Dayana Luque Avendaño's work (see Table C.6), a network diagram is proposed, Figure C.13, which seeks to visualize the interaction between the different actors and factors that make up the circular economy in the country. To better understand its dynamics, three key elements are analyzed: (i) the hierarchy of influence between actors, (ii) the role of structural factors and their impact, and (iii) critical interactions and their effect on the transition towards the circular economy.

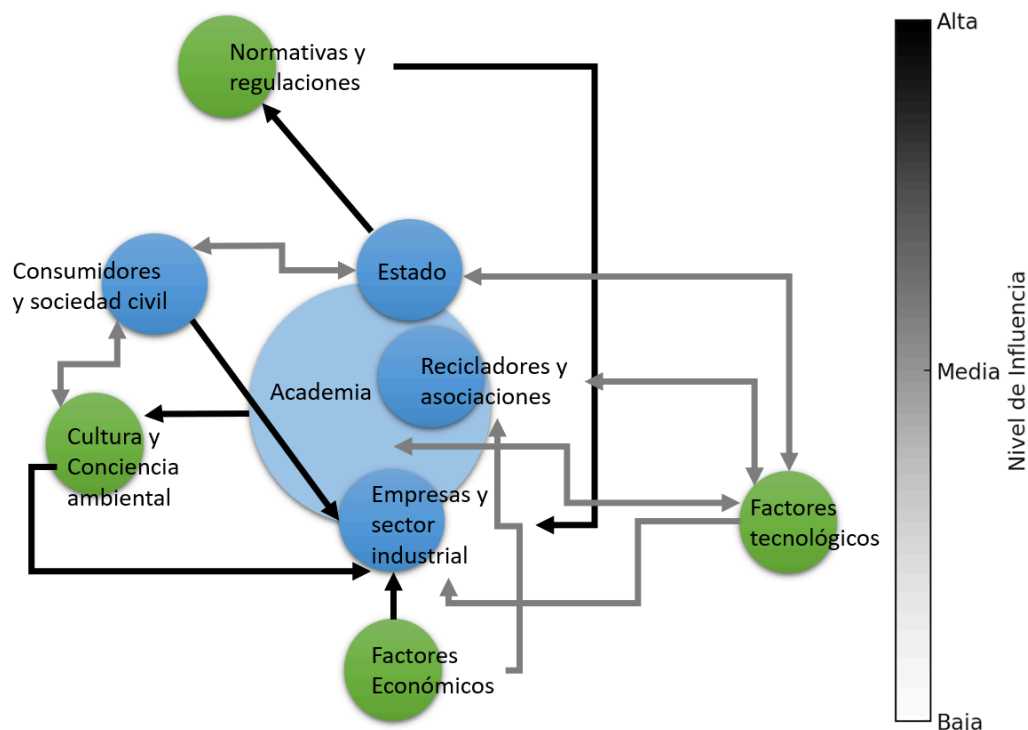


Figure C.13 Network diagram - Interaction and influence between actors and factors influencing the transition to the circular economy. Created by the authors.

The intensity of the connections between actors is represented in Figure C.13 with line thickness and grayscale, allowing us to visualize the actors that most influence the structure of the plastics circular economy. The results show the following:

Actors with the greatest structural influence

State (Government and Regulatory Entities)

- Its influence is direct and decisive due to its ability to issue regulations, environmental regulations, and establish economic incentives.
- Example: Law 2232 of 2022 on single-use plastics, which requires companies to redesign packaging and materials (straws, swabs, disposable party items, etc.).
- Relationship with factors: Main impact on regulation and market.

Industrial Sector and Processing Companies

- They represent the productive and technological capacity that defines the economic viability of recycling, eco-design, and the incorporation of circular economy models.
- Example: Enka of Colombia has promoted the transformation of recycled PET into textile fibers and resins, which reinforces the economic viability of recycling.
- Relationship with factors: Mainly affects technology and innovation and market demand.

Actors with intermediate influence

Academy and Research Centers

- Its influence lies in the development of knowledge and technologies, but its impact depends on effective transfer to industry and state support.
- Example: Some research at the National University on biopolymers and biodegradable plastics has generated alternatives to conventional polymers, but they require business support for their scalability.
- Relationship with factors: It affects technology and innovation, but with an indirect connection to the market.

Professional Recyclers and Solidarity Economy Organizations

- Their impact is key in the logistics of waste collection and separation, but they depend on regulations and market conditions.
- Example: The formalization of recyclers in Bogotá has improved the efficiency of plastic waste recycling, but economic barriers still exist.
- Relationship with factors: It affects the efficiency of waste management, but is subject to state regulations and market conditions.

Actors with less direct influence, but relevant to the sustainability of the system

Consumers and Civil Society

- Its impact is indirect but growing, as changing consumption patterns can put pressure on the industry to adopt circular practices.
- Example: Responsible consumption initiatives in Medellín and Bogotá have promoted the reduction of single-use plastics.
- Relationship with factors: It affects the market and environmental awareness.

Each actor interacts with factors that determine the circular economy. In Figure C.13, these factors are represented as nodes that connect various actors with different levels of influence.

Regulatory Factors: Regulation and Public Policies:

- Main driver of structural change.
- It directly impacts the industrial sector, recyclers, and the market.
- Example: The ban on single-use plastics in certain sectors has forced the industry to look for alternatives.

Factors associated with Technology and Innovation:

- Key to improving the viability of recycling, bioplastic production, and the development of circular models: ecodesign, reuse, and reconditioning.
- Its impact depends on investment from the industrial sector and academia.
- Example: The development of biodegradable polymers in universities requires business support for scaling.

Economic factors: Market and Demand:

- Factor that can accelerate or slow down the transition to the circular economy.
- Dependent on business decisions and consumer behavior.

- Example: Growing demand for recycled resins is driving the recycling industry, but cost barriers remain.

Factors associated with culture, awareness and environmental education:

- Its effect is long-term and depends on government campaigns and private initiatives.
- Example: School recycling programs have improved source separation in some cities.

From the analysis of the network diagram, Figure C.13, key relationships emerge that will determine the effectiveness of the EC in Colombia:

State → Regulation and Public Policies → Industrial Sector:

- Regulation creates incentives or barriers to the transformation of plastic waste.
- Stricter policies without adequate incentives can slow down the industry, while well-designed regulations can boost investment in recycling and eco-design.

Academy → Technology and Innovation → Industrial Sector:

- Technological innovation depends on knowledge transfer, but there are still gaps in implementation.
- Need to strengthen the connection between universities and businesses to improve the competitiveness of the circular economy.

Recyclers → Waste Management → Industry and Market:

- The efficiency of plastic recovery depends on the formalization and working conditions of recyclers.
- Greater government and private sector support can increase the volume and quality of recycled plastic available.

Consumers → Market and Demand → Industry:

- Increased consumption of recycled or sustainable products could pressure the industry to adopt circular economy models.
- Environmental education strategies can accelerate this transition.

As a summary of the network diagram presented in Figure C.13, it can be concluded that:

- The state and the industrial sector are the main agents of change, as regulations and business decisions determine the viability of the circular economy.
- Academia plays a fundamental role in innovation, but its impact depends on technological adoption by industry.
- Recyclers are essential to recycling logistics, but they require better conditions and formalization to improve their impact.
- Consumers can influence the circular economy through their purchasing decisions, but they require greater environmental education.
- The diagram shows that, to accelerate the transition to a circular economy, it is necessary to strengthen the interaction between regulations, technological innovation, and the market, reducing gaps between academia, industry, and recyclers.

Now, to strengthen the relationships between actors and factors in the CE ecosystem in Colombia, the following policies and strategies are proposed, supported by international experiences and proposals from national entities such as Acoplásticos, ANDI and the Bogotá Chamber of Commerce (Acoplásticos, 2023) (CCB, 2024) (ANDI, 2025):

Strengthening Regulation and Public Policies:

- **Implementation of Extended Producer Responsibility (EPR):** Requiring producers to take responsibility for the entire life cycle of their products, from manufacturing to final disposal. This policy has been effective in countries such as Chile and Mexico (Ministry of the Environment, 2024) (International Alliance of Waste Pickers & WIEGO, 2023).
- **Tax Incentives for Sustainable Practices:** Offer tax exemptions or tax reductions to companies that adopt circular economy practices, similar to the policies implemented in Brazil (Cezar & Balaguer, 2025).

Promotion of Technology and Innovation:

- **Creation of Innovation Centers in the Circular Economy:** Establish laboratories and research centers dedicated to the development of sustainable technologies, such as the laboratory inaugurated by SENA in Bogotá (SDA, 2022).
- **Public-Private Partnerships for Innovation:** Promote collaborations between the public and private sectors for the development of innovative solutions, following the example of the alliance between CAF and Tetra Pak in Latin America (CAF, 2025).

Market Development and Demand:

- **Public Awareness Campaigns:** Launch educational initiatives to raise consumer awareness about the importance of the circular economy, inspired by campaigns carried out in cities such as Córdoba and Fortaleza (Lecumberri, 2025).
- **Certifications and Green Labeling:** Implement certification systems for sustainable products, incentivizing companies to adopt circular practices and enabling consumers to make informed choices.

Improving Environmental Awareness and Education:

- **Incorporating the Circular Economy into Educational Plans:** Integrate concepts of sustainability and the circular economy into school and university curricula, following ECLAC recommendations (ECLAC, 2021).
- **Training Programs for Recyclers:** Offer training and certification to professional recyclers to improve their skills and working conditions, as promoted by the Bogotá Recyclers Association (ARB, n.d.).

Strengthening Infrastructure and Logistics:

- **Development of Recycling Infrastructure:** Invest in efficient recycling plants and collection systems, taking as a reference the initiatives of leading European cities in the circular economy.
- **Reverse Logistics Optimization:** Implement systems that facilitate the return and reuse of products, reducing waste and promoting circularity.

Promoting Intersectoral Collaboration:

- **Creation of Circular Economy Networks:** Promote collaboration between companies, governments, and civil society organizations to share best practices and resources, similar to the networks established in countries such as the Netherlands (European Union, 2021).
- **Active Participation of Guilds and Chambers of Commerce:** Involve entities such as Acoplásticos, ANDI and the Chamber of Commerce in the promotion and adoption of circular practices, aligning with national strategies (ANDI, 2025).

These policies and strategies, based on international experiences and national proposals, can strengthen relationships between key stakeholders and factors, accelerating the transition to a circular economy in Colombia.

C.2.5 Policies and strategies to strengthen relationships between stakeholders

According to Acoplásticos, it is estimated that around 350,000 tons of post-consumer plastic waste are recycled in Colombia each year. The results of the Survey on the Characterization and Growth of Plastics Recycling in Colombia show that recycled plastic grew 19% in tons and 145% in sales in 2021. This growth rate implies that Colombia can double its plastics recycling in just five years. At the same time, between 2019 and 2021, the installed capacity of the plastics recycling industry grew by 40%, with a 120% increase in investments. This has led to more than 60,000 registered professional recyclers currently benefiting from the dynamism generated by this sector.

On the other hand, the Ministry of Environment and Sustainable Development stated that “Colombia recycles 163,000 tons of plastic waste per year and that Bogotá and Medellín process 13,000 tons of plastic waste per month, supported by the work of professional recyclers and the network of nearly 260 processing industries. In 2019, the Single Information System for Household Services identified that 15.09% of the recycled materials, that is, 212,434 tons, correspond to the plastics family” (MinAmbiente, 2021).

According to Statista, the percentage distribution of plastic waste worldwide between 2020 and 2060, according to its final destination, will be as shown in Figure C.14. As can be seen, approximately 65% of plastics will be taken to landfills or mismanaged, up to 17% recycled, and a similar percentage incinerated. Furthermore, the OECD estimates that by 2040, only 6% of plastics will be well managed, and that inappropriate management and incineration will account for 50% and 20%, respectively (OECD, 2024). Thus, the situation in Colombia is similar to that of the rest of the world, but faces structural challenges in waste collection, separation, and transformation. Unlike countries like Brazil and Chile, which have more successfully implemented Extended Producer Responsibility (EPR) systems and energy recovery strategies, Colombia still lacks large-scale incineration plants as a management alternative. These types of plants are essential for managing contaminated, highly heterogeneous, and difficult-to-recycle plastic materials.

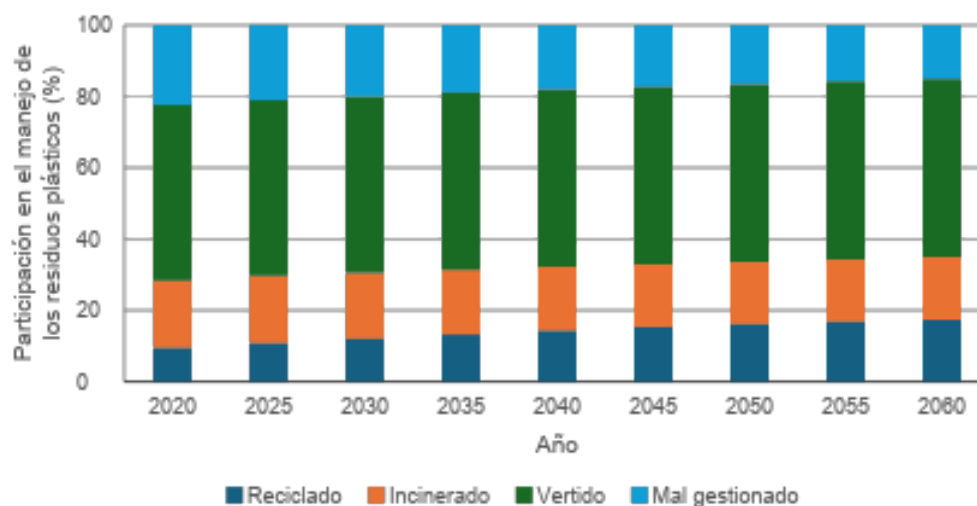


Figure C.14 Percentage distribution of plastic waste worldwide between 2020 and 2060. Constructed with data available at

<https://es.statista.com/estadisticas/1484226/distribucion-de-los-residuos-plasticos-a-nivel-mundial-s-egun-destino-final/>. Accessed March 13, 2025.

C.2.6 Plastic recycling in Colombia

From the partial understanding of the situation at the National University of Colombia, Bogotá campus, the relationship is limited to the proposal and, if approved, the implementation of research and extension projects for the development of products and processes that use biobased waste or raw materials for the production of polymers or finished products within the CE philosophy. In the case of the Chemical and Biochemical Processes Research Group, since the late 20th century, projects have been developed for the production of polyols from palm and soybean oils, and later from used cooking oils (UCO), which have subsequently been evaluated in the production of polyurethanes. The projects have been carried out in conjunction with companies such as Espumlatex and Espumados, and associations such as Fedepalma. Table C.7 presents a partial list of these research projects.

Table C.7 Research projects carried out by the Chemical and Biochemical Processes Research Group of the Department of Chemical and Environmental Engineering on the project topic.

Project	Year	Company the financier
Study of the stages of recycling post-consumer plastics	1996	National University of Colombia
Polymer blends: morphology and structure	1998	National University of Colombia
Synthesis of biodegradable polymers and copolymers based on lactic acid for pharmaceutical applications	2005	National University of Colombia – Chalver Laboratories
Production of polyester polyols from palm oil for the manufacture of flexible and rigid polyurethane foams	2006	Colciencias – National University of Colombia - Espumlatex
Production of polyurethane foams from soybean oil	2006	National University of Colombia
Development of bioadhesive and biodegradable materials from copolymers derived from lactic acid	2007	National University of Colombia
Scaling up the production process of biodegradable plastics using renewable carbon sources with native microorganisms	2007	National University of Colombia
Study of miscible blends of thermoplastic polymers and thermosetting polymer precursors	2007	National University of Colombia
Design of biodegradable packaging for cosmetic products in solid presentation.	2009	National University of Colombia
Development of a prototype reactor for microwave depolymerization of polyurethane	2015	National University of Colombia
Reuse of used vegetable oil in the production of epoxidized oils	2017	National University of Colombia
Production of polyols from palm oil	2020	Fedepalma - Foamed

The Central University (Bogotá) has developed a series of initiatives related to the circular economy, recycling, and support for professional recyclers. Below are some of its main initiatives in these areas:

Training and Capacity Building for Professional Recyclers

Diploma "Managing and Recycling": Since 2017, the Central University, in collaboration with Gerdau Diaco, has offered this diploma program for professional recyclers. To date, more than 300 recyclers have benefited, strengthening their skills in areas such as tax regulations, RUT management, office tools, proper waste management, and structuring recycling associations.

Entrepreneurship Course: In 2017, a 30-hour course focused on innovation, marketing, finance, and entrepreneurial models was offered, with the goal of improving the productivity and business management of participating recyclers.

Strategic Alliances with Recycling Associations

Puerta de Oro Recyclers Association of Bogotá: Since 2019, Universidad Central has worked with this association to improve waste management within the institution. Between 2018 and 2021, 8,673.8 kg of PET and 2,876.3 kg of low-density plastic were collected and delivered for transformation into new products, thus promoting the circular economy.

Events and Awareness Activities
University Recycling Fair "Diverciclaje": In September 2021, the first edition of this fair was held with the aim of raising awareness among the university community about the importance of recycling in everyday life.

Celebration of National Recycler's Day: The university has recognized the work of professional recyclers, highlighting their importance in the waste management chain and their contribution to environmental sustainability.

Promotion of the Circular Economy

Forums and Publications: The Central University has organized events and published articles highlighting the importance of the circular economy as a model for a sustainable future, promoting new forms of waste management and more environmentally friendly production processes.

These initiatives reflect the Central University's commitment to sustainability, social inclusion, and the promotion of responsible waste management practices, strengthening its role as an agent of change in society.

In addition to the universities involved in the project, other institutions are developing research and technological development projects with companies and institutions on innovative projects involving biodegradable plastic materials, mechanical and chemical recycling, and plastic waste recovery. Some examples are presented below:

University of the Andes

Through its Advanced Materials and Energy Research Center, the Universidad de los Andes has worked on projects involving biopolymers, chemical recycling, and new materials from plastic waste. Companies in the sector have funded research into compostable materials and sustainable packaging.

University of Valle

The Polymer Research Group has worked with the industrial sector on mechanical recycling of post-consumer plastics and the formulation of recycled materials for applications in the construction and automotive industries.

Regarding academic programs, universities such as the National University, the University of Antioquia, and the Pontifical Javeriana University have incorporated modules and specializations in waste management and the circular economy into their chemical, environmental, and materials engineering programs. The Central University offers the subject "Circular Economy and Green Business" as an elective in the Faculty of Engineering. The Plastics and Rubber Research and Training Institute (ICIPC) provides training on plastics issues, with the circular economy as one of its focuses.

These institutions train professionals capable of implementing sustainability strategies in the plastics industry.

Likewise, some universities have promoted entrepreneurship in the plastics recycling sector through incubators and innovation programs. One example is Bio'Kim, a startup founded in Bogotá that has developed deinking technologies to recover post-industrial plastic materials.

In summary, although the relationship between universities and the industrial sector in Colombia regarding plastics recycling has been growing, driven by the need for sustainable solutions and the circular economy, and there has been progress in research,

technological development, and training, there is a need to further strengthen the connection between academia and business, promoting the effective transfer of knowledge and the industrial application of innovations in recycling and new materials.

C.2.8 Innovations in the plastics industry

The plastics industry in Colombia is evolving with a strong focus on innovation and sustainability. Below are some of the key advances and examples of companies leading this transformation.

Circular Economy and Recycling

Companies have adopted circular economy strategies to reduce the use of virgin plastics and promote recycling.

Enka from Colombia: Founded in 1964, this company has been a pioneer in recycling in the country. In 2009, it opened a PET recycling plant, and in 2018 and 2023, it launched plants for recycling caps and labels for polyolefin production. Its approach has allowed it to close the loop on these materials and reduce dependence on virgin plastic resins (Enka, 2018).

Recycle (Plastilene Group): Specializing in post-consumer plastic recycling, it produces high-quality recycled resins for flexible packaging, promoting the reuse of materials in the packaging industry (Reciclene, 2020).

Mexichem Resinas S.A.S. (VESTOLIT): It promotes PVC sustainability in Latin America through its "Vinyl in Motion" program, which promotes the recycling of post-industrial and post-consumer PVC waste. The initiative empowers recyclers and connects key players in the value chain to integrate recycled PVC into new products under a circular economy model. The program is currently recognized for its consumer focus and for transforming more than 3,000 tons of PVC annually into new applications (Acoplásticos, 2024c).

Andercol: It works in the transformation of collected material, especially transparent PET, oil-impregnated PET and amber-colored PET (Andercol, 2024).

Investments in Technology and Modernization

The sector has modernized its infrastructure with advanced machinery to improve efficiency and sustainability.

Rambal: It has developed quality control systems with artificial vision and dosing solutions for flexible packaging, improving the precision and efficiency of production processes (La Nota Económica, 2024).

Bio'Kim: A Bogotá-based company that has innovated with technology for deinking plastic films, enabling the recovery of high-quality post-industrial materials for reuse.

ESTRA Industries S.A.: The production of their products includes PCR, and they are pioneers in the incorporation of Industry 4.0 technologies focused on energy efficiency and productivity (Estra, 2024).

Sustainable Product Development

Innovation in materials and processes has driven the creation of biodegradable or recyclable products.

Green Plastic Colombia SAS: It is dedicated to the recovery and transformation of plastic waste into new products, promoting the closing of the plastic cycle within the circular economy (Green Plastic, 2021).

ProUSAR: Initiative that supports sustainability and innovation in the plastics industry, promoting responsible and efficient practices in the production and use of plastics.

Community and Social Projects

Companies are engaging with the community to promote a culture of recycling and sustainability.

Bottles of Love: An initiative that encourages the community to collect hard-to-recycle plastics in bottles, which are then used to make plastic lumber for street furniture. (Bottles of Love, 2023)

Specialized Fairs and Events

COLOMBIAPLAST: Key event presenting advances in chemical recycling, eco-design, and bioplastics, connecting companies and professionals with innovative solutions for the industry (Colombiaplast, 2025).

In conclusion, the Colombian plastics industry is transitioning toward a more sustainable model through circular economy strategies, technological innovation, and the development of products with a lower environmental impact. Companies such as Enka, Reciclene, Bio'Kim, and Green Plastic Colombia are leading the way with initiatives that not only optimize industrial processes but also generate a positive impact on plastic waste management. This transformation not only responds to environmental regulations but also to a growing market and societal demand for more sustainable solutions.

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A.4 Meeting minutes template

Acta de reunión – TechtraplastiCE		Universidad: [Nombre del gestor/a e institución responsable]
Fecha: [DD/MM/AAAA] Hora: [HH:MM]	Lugar/Modalidad: [Presencial / Virtual – especificar lugar o plataforma]	Empresa: [Nombre de la empresa] Representante(s): [Nombre(s), cargo(s), correo(s)]
Motivo de la reunión:		

1. Principales temas abordados:

2. Brechas y desafíos identificados:

3. Observaciones adicionales:**4. Registro de la sesión (fotografía/screenshot)**

A.5 Framework Worktool

E FRAMEWORK TOOL

E.1 REGULATORY FRAMEWORK: NATIONAL AND INTERNATIONAL LAWS AND REGULATIONS ABOUT PLASTICS AND THE CIRCULAR ECONOMY

Objectives:

- Identify public policies: government programs and relevant national and international strategies.
- Identify and analyze economic, technological and social factors in policies that influence the plastic circularity.

Key questions to structure Chapter 1 (from various sources of information):

1. What international agreements and treaties influence the country's regulation and management of plastics?
2. What national regulations govern the production, use and disposal of plastics?
3. Are there local public policies that promote the circular economy in the plastics sector?
4. What regulatory or legal barriers limit companies' transition to a circular economy?
5. What economic and technological factors are relevant for implementing circular economic policies in the country?
6. What international trends could be replicated or adapted locally?

Key questions to ask companies:

- What actions has the company taken to comply with the legislation applicable to the plastics sector/circular economy?
- What are the barriers or challenges companies face in complying with local legislation?
- What benefits does the company obtain or could obtain by complying with local legislation?

Note: In the case of working with associations or organizations of recyclers/recyclers, each Universities can adapt the questions according to their context and regulations.

E.2 THE PLASTICS INDUSTRY ON A NATIONAL LEVEL

Objectives:

- To analyze the state of the plastics industry in the country, considering its structure, size, distribution, and the most significant final applications.
- Classification by company size, product types, and the sector's geographic and economic distribution.
- Defining the plastics value chain by establishing the plastics ecosystem.

Key questions to structure Chapter 1 (from various sources of information):

1. What are the main characteristics of the plastics sector in terms of size and type of companies?
2. How are the companies in the plastics sector geographically distributed in the country?
3. What types of plastic products are most relevant in the domestic market?
4. What are the country's main end-use applications for plastic products?
5. Which segments of the plastics production chain have the most significant potential for adopting circular economy models?

Key questions to ask companies:

- What is the size and type of company?
- Where is the company located?
- What plastic products do you handle and for what type of applications?

Note: In the case of working with associations or organizations of recyclers/recyclers, each Universities can adapt the questions according to their context and regulations.

E.3 KEY FACTORS AND ACTORS IN THE TRANSITION TO THE CIRCULAR ECONOMY

Objectives:

- Identify the determining factors (opportunities, weaknesses, barriers, strengths, challenges, among others) that influence the transition of the plastics sector towards a circular economy.
- Understand the role of key players, such as industry, government, academia, civil society, and consumers, in the plastic ecosystem and the circular economy.
- Examine the relationships between factors and actors.

Key questions to structure Chapter 1 (from various sources of information):

1. What opportunities exist to promote the circular economy in the plastics sector?
2. What weaknesses or barriers do local companies face in this transition?
3. Which players are key to driving the circular economy in the plastics sector?
4. How do stakeholders interact with each other and with the factors influencing the circular economy?
5. What policies or strategies could strengthen these relationships?
6. How is plastic recycling in the country compared to Latin America and the rest of the world?
7. How are universities related to the industrial sector and plastic recycling?
8. How is the plastics industry innovating in the country?

Key questions to ask companies:

- What opportunities does your company identify for adopting circular economy practices?
- What weaknesses or barriers does your company encounter in this transition?
- Which stakeholders are key for your company during its transition to the circular economy or for compliance with legislation?
- How does your company collaborate with universities in the adoption of circular economy practices?
- What innovations have you developed to implement circular economy practices that benefit the environment and sustainable development?
- How is your company adapting to comply with regulations (examples include single-use plastic, Extended Producer Responsibility (EPR), among others)?
- What actions have you taken to prevent the generation of plastic waste?
- If the company is involved in the production of containers or packaging, is it working on products with materials that allow for multiple uses without compromising quality?
- Is the company incorporating recyclable or compostable materials in its process? Is recycled plastic being used in new products?

Note: In the case of working with associations or organizations of recyclers/recyclers, each Universities can adapt the questions according to their context and regulations.

A.6 Answers from Argentina

F QUESTIONNAIRE AND INTERVIEW RESPONSES: ARGENTINA

Nombre de la empresa/entidad/asociación	¿Qué acciones ha tomado la empresa/entidad/asociación para el cumplimiento de la legislación aplicable al sector plástico/economía circular?	¿Cuáles son las barreras o desafíos que tiene la empresa/entidad/asociación para cumplir la legislación local?	¿Cuáles son los beneficios que obtiene la empresa/entidad/asociación por cumplir con la legislación local?	¿Qué oportunidades identifica su empresa/entidad/asociación para adoptar prácticas de economía circular?	¿Qué debilidades o barreras enfrenta su empresa/entidad/asociación en esta transición?	¿Qué actores son clave para su empresa/entidad/asociación en la transición hacia la economía circular o para el cumplimiento de la legislación?	¿Cómo se relaciona su empresa/entidad/asociación con las universidades en la adopción de prácticas de economía circular?	¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?	¿Cómo se está adaptando su empresa/entidad/asociación para el cumplimiento de la normatividad?
RAPET	somos socios de Cairplas, obtuvimos el sello INTI-CAIRPLAS, estamos inscriptos en el programa 0 pérdida de pellets.	impuestos altos, costos elevados de disposición final de materiales, inexistencia de proyectos de incentivo al reciclaje.	no obtuvimos ningún beneficio por cumplir con la norma vigente, justamente este es el problema	somos una empresa de economía circular, así que esta pregunta no aplicaría a nosotros.	idem pregunta anterior.	el estado y los grandes jugadores del mercado.	Tenemos convenio con universidades para realizar prácticas laborales en la empresa, dar charlas en colegios / universidades sobre el reciclado, también estamos inscriptos en la guía educativa del municipio de mercedes, mediante la cual nos visitan muchos colegios.	programa "ZERO LANDFILL", incorporación de tecnología de último nivel, nuevos desarrollos de productos / subproductos.	actualmente nosotros cumplimos con la normativa, porque justamente nos encargamos del reciclado, pero siempre tenemos la visión de reducir al máximo el envío de materiales al relleno sanitario, el incremento del volumen de material a reciclar y el valor agregado de cada kilo reciclado.
FABEN S.A.	No hay legislación vigente en la materia. De todos modos, hemos adoptado procedimientos y criterios alineados con la reciclabilidad, desde el diseño de los envases. Pensar en envases monomateriales, optimización de espesores y conservación del producto a envasar.	Para cumplir con los criterios de reciclabilidad, necesarios para la circularidad de los plásticos, observamos como desafíos que estos envases funcionen correctamente en las envasadoras de los clientes, comparando con las estructuras actuales (hermeticidad, resistencia al abuso, estética, deslizamiento, productividad). También el costo hoy es una barrera	Por el momento solo podemos decir que cumpliríamos con el compromiso asumido con el medio ambiente, al ser una empresa comprometida con su política (certificamos ISO 14000, entre otras)	Estar a la vanguardia en los requerimientos de clientes, esto nos diferenciaría de la competencia.	Nosotros como fabricantes de envases para alimentos no podríamos incorporar materiales PCR. Nuestra producción de envases para aplicaciones no alimenticias es muy pequeña.	El estado como propulsor de leyes y encargado de su cumplimiento. Entendemos que si no hay una ley que obligue, los proyectos de circularidad no prosperan.	Estamos en contacto con universidades y centros especializados. Tenemos personal idóneo para la conectividad entre las partes. Solemos contratar los servicios de análisis de laboratorios y de asesoramientos varios.	Por el momento, desarrollar alternativas en el diseño de envases. Criterios en el diseño para minimizar el impacto en la reciclabilidad. Ofrecer a clientes las innovaciones que surgen de los proveedores que ya están trabajando en la temática.	Por el momento, solo iniciativas desde el área de I&D. Acabamos de invertir en tecnología para coextrudir films barrera y así poder proponer soluciones de reducción de espesores y monomateriales.

Nombre de la empresa/entidad/asociación	¿Qué acciones ha tomado la empresa/entidad/asociación para el cumplimiento de la legislación aplicable al sector plástico/economía circular?	¿Cuáles son las barreras o desafíos que tiene la empresa/entidad/asociación para cumplir la legislación local?	¿Cuáles son los beneficios que obtiene la empresa/entidad/asociación por cumplir con la legislación local?	¿Qué oportunidades identifica su empresa/entidad/asociación para adoptar prácticas de economía circular?	¿Qué debilidades o barreras enfrenta su empresa/entidad/asociación en esta transición?	¿Qué actores son clave para su empresa/entidad/asociación en la transición hacia la economía circular o para el cumplimiento de la legislación?	¿Cómo se relaciona su empresa/entidad/asociación con las universidades en la adopción de prácticas de economía circular?	¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?	¿Cómo se está adaptando su empresa/entidad/asociación para el cumplimiento de la normatividad?
Ecotecnica del pilar srl	Nosotros tenemos convenios con diferentes municipios, q nos traen plástico y le devolvemos madera plástica	Hoy el reciclado no es negocio	Ninguno	Q se recicle más ! Pero conveniencia económica hoy no hay	Perder plata	Las municipalidades	Lo hemos hecho	Adicionamos la madera plástica Lo q antes pagábamos para q se lo lleven , hoy se pone en madera plástica	No uso nada de un solo uso
Servicio Servicios Ecologicos SA	Estamos habilitados por MAPBA con NE1	competencia desleal en el control de los operadores no habilitados	barreras de ingreso a competidores. Las empresas grandes que quieren certificación (Que son pocas) no miran tanto el precio del scrap, sino que buscan calidad de servicio. A parte de eso no habría ningún otro beneficio.	Estamos implementando. En general no compiten contra el uso de material virgen, que en varios casos termina siendo más económico	altas demandas de los clientes, insuficiente rentabilidad para mejorar la estructura y herramientas en todos los aspectos de una organización	MAPBA y los controles a los generadores y recicladores no habilitados	Economía circular con universidades no tenemos ningún tipo de contacto. Estamos empezando con pasantías y practicas pre profesionales	recuperamos scrap de baja densidad para convertirla en bolsas que vuelven a los clientes como producto terminado	no somos productores de scrap de materiales vírgenes. ¿Aplicaría a nosotros?
PULPO S.A	Documentación, presentaciones anuales y emisión de certificados	En ciertos procesos la documentación solicitada es excesiva	Habilitación provincial de tratadores de residuos valorizables y acceso a certificados de origen para exportación con beneficio promocional	La búsqueda constante de realizar un productos final con los plásticos de menos salida, un primer intento fue realizar baldosas plásticas.	Clasificación en origen de los residuos y costos de procesos productivos versus valor de venta del producto reciclado obtenido	Organismos de control, generando normas de aplicación general tendiente a la disposición responsable de residuos	Si, a través de la difusión conjunta de proyectos ambientales	Se implemento un sistema de recepciones para lograr una mejor trazabilidad de los residuos.	Para lograr adaptarse pulpo debió contratar un consultor ambiental el cual debió presentar guías de proyectos de los distintos materiales tratados y de los distintos procesos realizados. También crear registros de los materiales recibidos y la extensión de certificados de tratamientos realizados a esos residuos
ENVATEX BAHIA S.A.	desconozco legislación en profundidad .Cumplimos con reglamentación residuos especiales	DESCONOZCO LEGISLACION .	DESCONOZCO	NOS MEJORA LA PENETRACION EN EL MERCADO CON CLIENTES CERTIFICADOS.	INFORMACION Y RENTABILIDAD .	Poder desarrollar algun producto en el cual podamos volcar todo el material recuperado.	no colaboramos , si consultamos.	LINEA DE RECICLADO Y REUTILIZACION .	Implementamos un aumento del PP recuperado dentro de lo posible.

CAMARA DE LA INDUSTRIA QUIMICA Y PETROQUIMICA	A nivel local, la CIQyP participa activamente en el apoyo de las iniciativas que fomenten la economía circular de los plásticos en el ámbito empresarial y los niveles gubernamentales del ejecutivo y legislativo. A partir marzo 2022 y por medio de la Resolución UNEA 5/14 de la Asamblea de las Naciones Unidas para el Medio Ambiente se comenzó a diseñar un instrumento jurídicamente vinculante para poner fin a la contaminación por residuos plásticos. El sector participa activamente de las negociaciones de la INC (International Negotiation of Conference), como parte involucrada y en los grupo de trabajo de composición abierta	Dado que no existe una legislación nacional sobre el tema, las empresas asociadas cumplen con las diferentes legislaciones jurisdiccionales. Esto lleva un terrible esfuerzo debido a las diferencias entre las mismas. Por tanto el principal desafío que tiene Argentina es tener leyes nacionales de presupuestos mínimos sobre el tema.	Beneficios Económicos: posible reducción de costos por el uso de materias primas circulares, generación de nuevos negocios, optimización del uso de recursos, posible acceso a financiamiento más blandos e incentivos fiscales. Beneficios Ambientales: reducción de residuos y pérdidas, menor huella ambiental y de carbono, reducción de la contaminación y ahorro de energía Beneficios reputacionales: mejora de la imagen corporativa por adopción de buenas prácticas, posible atracción de inversión de socios estratégicos, inversión en innovación y desarrollo de nuevas tecnologías para una mejor imagen del mercado, contribución a la agenda 2030 y a los ODS, principalmente al número 12 (Producción y Consumo Responsables) La CIQyP por medio de su PROGRAMA DE CUIDADO RESPONSABLE del MEDIO AMBIENTE, (www.pcrma.org) no solo da cumplimiento legal en materia de economía circular, de los Plásticos no es solo una obligación legal, sino que lo ve como una oportunidad estratégica con beneficios económicos, ambientales y sociales para fortalecer su posición en el mercado y contribuir a un futuro más sostenible.	Las indicadas en la pregunta anterior	Legislación, especialmente la sanción una ley REP de envases	Todos los involucrados en la cadena de valor: productores, transformadores, recicladores y la sociedad en su conjunto	La Cámara de la Industria Química y Petroquímica (CIQyP) en Argentina, como actor clave en el sector, mantiene una relación importante con las universidades para impulsar la adopción de prácticas de economía circular, especialmente en lo que respecta a los plásticos por medio del apoyo de sus empresas socias a proyectos de investigación y Desarrollo (I+D), difusión de conocimiento, formación y capacitación en charlas y talleres sobre la importancia de la economía circular y las oportunidades y beneficios, articulación Público-Privada por medio de iniciativas agrupan a diferentes actores (gobierno, empresas, universidades, ONGs (un ejemplo de esto es la iniciativa EURECA -Entidades Unidas Reafirmando la Economía Circular en Argentina- donde la CIQyP es una de las entidades participantes junto a otras cámaras y asociaciones del sector; diálogo y propuestas de políticas públicas y en la investigación de otras fuentes (polímeros de origen vegetal), impulsando la innovación en el sector.	Ver respuesta pregunta anterior	Ver respuestas anteriores.
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Nombre de la empresa/entidad/asociación	¿Qué acciones ha tomado la empresa/entidad/asociación para el cumplimiento de la legislación aplicable al sector plástico/economía circular?	¿Cuáles son las barreras o desafíos que tiene la empresa/entidad/asociación para cumplir la legislación local?	¿Cuáles son los beneficios que obtiene la empresa/entidad/asociación por cumplir con la legislación local?	¿Qué oportunidades identifica su empresa/entidad/asociación para adoptar prácticas de economía circular?	¿Qué debilidades o barreras enfrenta su empresa/entidad/asociación en esta transición?	¿Qué actores son clave para su empresa/entidad/asociación en la transición hacia la economía circular o para el cumplimiento de la legislación?	¿Cómo se relaciona su empresa/entidad/asociación con las universidades en la adopción de prácticas de economía circular?	¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?	¿Cómo se está adaptando su empresa/entidad/asociación para el cumplimiento de la normatividad?
Fundación Banco de Plásticos	No aplica	No aplica	Una futura ley REP con inclusión de los Bonos de Plástico como SIG podría incentivar el mercado y mejorar la situación del reciclado de plástico.	Nosotros promovemos que las empresas adopten Bonos de Plástico como una herramienta más para compensar la huella de plástico.	Falta de una ley REP.	No aplica	Damos charlas en universidades sobre economía circular de plásticos y el mercado de Bonos de Plástico.	Los Bonos de Plástico son un título que certifica que el titular ha sido responsable por la recolección y reciclado de 1 tn de plástico posconsumo. Son emitidos por empresas recicladoras y comprados por empresas, marcas o eventos que desean compensar su huella de plástico. De esta manera las empresas recicladoras reciben dinero extra para invertir en infraestructura, personal, etc. y aumentar las toneladas recicladas.	Trabajamos para que los Bonos de Plástico sean un SIG dentro de una futura ley REP en Argentina.
Alpek Polyester	Hemos invertido hace más de 10 años en la primer Planta de PET reciclado apto para contacto con alimentos en Argentina.	La principal barrera es la falta de legislación local que incentive y norme el reciclado de PET exigiendo un contenido creciente. Esto hace que la inversión nunca tuvo economía de reinversión y se encuentra perdiendo dinero.	Ninguno, la legislación como menciono mas arriba no incentiva el reciclado.	La existencia de legislación que incentive la circularidad.	Un entorno económico muy difícil, volumen de ventas que no le dan sustentabilidad a la operación.	Poder Legislativo (fijación de normativa) y Ejecutivo (su promulgación y reglamentación).	No es necesario en el corto plazo.	Inversión de 30 millones de dólares en tecnología de punta para reciclar botellas de PET y producir resina que pueda ser utilizada nuevamente para contacto con alimentos.	No aplica.

Nombre de la empresa/entidad/asociación	¿Qué acciones ha tomado la empresa/entidad/asociación para el cumplimiento de la legislación aplicable al sector plástico/economía circular?	¿Cuáles son las barreras o desafíos que tiene la empresa/entidad/asociación para cumplir la legislación local?	¿Cuáles son los beneficios que obtiene la empresa/entidad/asociación por cumplir con la legislación local?	¿Qué oportunidades identifica su empresa/entidad/asociación para adoptar prácticas de economía circular?	¿Qué debilidades o barreras enfrenta su empresa/entidad/asociación en esta transición?	¿Qué actores son clave para su empresa/entidad/asociación en la transición hacia la economía circular o para el cumplimiento de la legislación?	¿Cómo se relaciona su empresa/entidad/asociación con las universidades en la adopción de prácticas de economía circular?	¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?	¿Cómo se está adaptando su empresa/entidad/asociación para el cumplimiento de la normatividad?
braskem	inversiones en capacidades de resinas biobasadas, inversión en laboratorio de desarrollo de envases sustentables entre otras.	la legislación local en Argentina no se actualiza al ritmo que lo hacen las normativas europeas o fda	no se evidencian mayores beneficios que el permitir operar en el país	la necesidad de los brand owners de tener soluciones circulares	en el escenario actual hay estrategias como el reciclado mecánico están desafiados en costos.	brand owners, legislación orientada hacia la economía circular	Actividades en Brasil compartidas en las redes	resinas de polietileno biobasadas que permite obtener productos reciclables y con menor emisiones de CO2	estamos apoyando técnicamente a la cadena para ajustar los productos a los requisitos.
Dow	En Argentina, no existe legislación vigente aún sobre circularidad que regule al sector (si existen requisitos técnicos y de seguridad obligatorios).	En Argentina, no existe legislación vigente aún sobre circularidad que regule al sector (si existen requisitos técnicos y de seguridad obligatorios).	En Argentina, no existe legislación vigente aún sobre circularidad que regule al sector plástico (si existen requisitos técnicos y de seguridad obligatorios).	Consideramos que la economía circular es una de las prioridades de la compañía, y es una de sus metas de sustentabilidad globales. En ese sentido, la venta de resinas de origen reciclado es una de las líneas comerciales de Dow, que convive junto con la venta de resinas vírgenes.	La falta de políticas públicas, lo que abarca tanto una ley de responsabilidad extendida del productor, como metas de contenido reciclado obligatorias en envases, son barreras que impiden un mayor crecimiento del negocio de resinas recicladas.	Estado, consumidores, sociedad civil, recicladores, recuperadores, entre otros	Si	Desarrollo de envases monomaterial para facilitar su reciclado, exploración de uso de inteligencia artificial y blockchain para categorizar y realizar trazabilidad de residuos o material reciclable	En Argentina, no existe legislación vigente aún sobre circularidad que regule al sector plástico (si existen requisitos técnicos y de seguridad obligatorios). Si bien existen prohibiciones de plásticos de un solo uso en gobiernos provinciales y municipales, son bastante específicas (para sorbetes y bolsas más que nada) y afectan directamente a los productores de estas aplicaciones, no a los productores de resinas del sector petroquímico.
PETROCUYO	Manejo de residuos acorde a las leyes, separación de reciclables, compostaje, materiales con plástico reciclado, innovación y ecodiseño a través del desarrollo de productos.	Las plantas productoras de Petrocuyo se encuentran en Ensenada y Luján de Cuyo Mendoza. La ley vigente de economía circular es de CABA, a nivel nacional no tenemos todavía una LEY REP ni de Economía circular unificada. Esto en sí mismo es una barrera para la oferta de materiales que contengan material reciclado.	no hay legislación local de Economía circular en la zona de las plantas.	Estamos notando un incremento en la demanda de materia prima plástica con PCR (PLÁSTICO RECICLADO POSCONSUMO) EJ MERCADO AUTOMOTRIZ	En Argentina se reciclan 298.000 TN/Año (Ecoplas) es aproximadamente el 10% del mercado de plásticos, es un valor bajo, por lo que la disponibilidad de materia prima es la debilidad mayor para el desarrollo de la EC	Productores, transformadores, envasadores, brand owners, recicladores y municipios.	A través del IPA estamos en contacto con entidades referentes, PLAPIQUI, UNIV NACIONAL DEL SUR, ECOPLAS, CIQYP	ECODISEÑO DE PRODUCTOS EJ, materiales de alta fluencia, TWIM y termoforado (reducción de espesores)	Estamos trabajando el tema a través de Ecoplas. Aún no hay normativa REP

Nombre de la empresa/entidad/asociación	¿Qué acciones ha tomado la empresa/entidad/asociación para el cumplimiento de la legislación aplicable al sector plástico/economía circular?	¿Cuáles son las barreras o desafíos que tiene la empresa/entidad/asociación para cumplir la legislación local?	¿Cuáles son los beneficios que obtiene la empresa/entidad/asociación por cumplir con la legislación local?	¿Qué oportunidades identifica su empresa/entidad/asociación para adoptar prácticas de economía circular?	¿Qué debilidades o barreras enfrenta su empresa/entidad/asociación en esta transición?	¿Qué actores son clave para su empresa/entidad/asociación en la transición hacia la economía circular o para el cumplimiento de la legislación?	¿Cómo se relaciona su empresa/entidad/asociación con las universidades en la adopción de prácticas de economía circular?	¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?	¿Cómo se está adaptando su empresa/entidad/asociación para el cumplimiento de la normatividad?
LP SRL	NO HAY LEGISLACION AL RESPECTO	NO HAY	NO HAY	SOMOS RECICLADORES PERO HOY LOS NUMEROS NO CIERRAN	NO HAY INSENTIVOS AL RECICLADO	NO HAY LEGISLACION	DAMOS CAPACITACIONES Y DESARROLLAMOS PROGRAMAS PARA FOMENTAR LA ECONOMIA CIRCULAR	HEMOS DESARROLLADO TECNOLOGIA PARA RECICLAR EL 99% DE LOS PLASTICOS POST CONSUMO, HEMOS INVERTIDO EN MAQUINAS PARA TENER MAYOR EFICIENCIA EN NUESTRAS LINEAS DE RECICLADO TRADICIONAL ES. HEMOS INVERTIDO EN PANELES SOLARES. CAMBIO DE LUMINARIAS A LED, MAYOR SUPERFICIE DE CHAPAS TRASLUCIDAS	NO HAY
Cabelma	Iniciativa de emitir bonos de plástico	-	Ninguno	Ciertos clientes lo consideran un valor agregado	Generalmente incurren en costos/gastos	Fundación Banco de Plásticos	Hemos trabajado con el INTI para desarrollo de reciclados	Emisión de bonos de plástico	Comunicando más sobre nuestras iniciativas de reciclado
Reciclar Recycling Technology S.A	EL ADN de nuestra empresa es reciclaje de todos los plásticos proveniente de los residuos electrónicos.	El bajo valor económico que tienen los materiales reciclados.	Ninguna	Cuidado del Medio ambiente, aprovechamiento de Materiales.	Falta de cumplimiento legislaciones, concientización ambiental y precios de los materiales reciclados que son bajos.	Gobierno y grandes empresas, ley rep	Brindamos talleres y alumnos hacen pasantías.	Nuestro modelo de impacto se basa en EC y DS.	Trabajamos para que nuestro impacto osea recolección de raae aumente día a día para lograr descontaminar más el planeta .
Cyclus S.A.	Para los servicios que hemos realizado hay vacío legal	No hay legislación específica en varios casos concretos . Hay que encuadrarse en normas vigentes , lo que no es conveniente para las empresas y es perjudicial para medio ambiente	Ninguno	Varias, pero principalmente para empresas o pymes u organismos que quieren realizar acciones con sentido reputacional	Vacío en regulaciones nacionales. Falta de incentivos económicos para empresas que adopten desarrollos de Economía Circular	Sector Gubernamental , sector tecnológico, sector científico, cámaras empresariales	Sí colabora	A nivel nacional, ninguna. A nivel regional , sí	No corresponde

Nombre de la empresa/entidad/asociación	¿Qué acciones ha tomado la empresa/entidad/asociación para el cumplimiento de la legislación aplicable al sector plástico/economía circular?	¿Cuáles son las barreras o desafíos que tiene la empresa/entidad/asociación para cumplir la legislación local?	¿Cuáles son los beneficios que obtiene la empresa/entidad/asociación por cumplir con la legislación local?	¿Qué oportunidades identifica su empresa/entidad/asociación para adoptar prácticas de economía circular?	¿Qué debilidades o barreras enfrenta su empresa/entidad/asociación en esta transición?	¿Qué actores son clave para su empresa/entidad/asociación en la transición hacia la economía circular o para el cumplimiento de la legislación?	¿Cómo se relaciona su empresa/entidad/asociación con las universidades en la adopción de prácticas de economía circular?	¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?	¿Cómo se está adaptando su empresa/entidad/asociación para el cumplimiento de la normatividad?
Cooperativa de Trabajo Re Accionar por la Sustentabilidad LTDA	Re Accionar es un estudio de diseño para la sustentabilidad que trabaja con residuos plásticos posconsumo y posindustriales. Nos alineamos con las leyes de gestión integral de residuos y promovemos activamente los principios de la economía circular a través del ecodiseño y la valorización de materiales reciclables. Además, contribuimos a la difusión y educación ambiental, brindando charlas y talleres en instituciones educativas y empresas, en línea con la Ley de Educación Ambiental Integral. Estas actividades fortalecen el cumplimiento del rol social que la legislación otorga a actores vinculados con el desarrollo sostenible. Finalmente, fomentamos la transparencia mediante la documentación de nuestros procesos y la comunicación clara del impacto ambiental de nuestros productos a través de nuestras redes sociales.	Como emprendimiento naciente, aplicamos buenas prácticas, pero contamos con maquinaria y recursos que hemos construido nosotros mismos. No tenemos tanto conocimiento sobre la legislación local.	Por el momento, no sabemos de ninguno.	Todo nuestro accionar se basa en la economía circular, el beneficio principal para nosotros es el comercial, ya que constituye nuestra principal propuesta de valor. También a nivel flujo de materiales y residuos internos, se reduce considerablemente, ya que los residuos de producción los usamos casi en su totalidad, compostamos los residuos orgánicos generados por el equipo y lo único que queda es la basura que es muy menor.	No fue una transición, fue constitutivo desde nuestros comienzos	Las cooperativas de separación de residuos, empresas recuperadoras e industrias con residuos industriales. Y sobre todo, nuestros clientes que eligen y compran los productos, cuanto más vendamos, más podemos comprar y procesar residuos.	Tenemos trato con la Universidad de San Martín, en la que participamos en el proyecto Palancas. También con la FADU UBA, a la que vamos periódicamente a diferentes cátedras y eventos a dar charlas, como también en la Universidad de Palermo.	Toda nuestra propuesta de valor, desde el desarrollo de las máquinas hasta los productos que vendemos están basados en la economía circular y reciclaje de residuos plásticos. Nuestros productos chicos están fabricados con 100% plástico reciclado. Los mobiliarios algunos están hechos con 100% plástico reciclado, mientras que otros tienen base de hierro, todos son 100% reciclables y reparables.	Todos nuestros productos son 100% reciclables y reparables, damos descuentos a nuestros clientes en la compra de nuevos productos si nos entregan los viejos. Esto es totalmente innovador en la industria y comercialización de muebles, que la mayoría de los insumos utilizados no son reciclados.

A.7 Answers from Chile

G QUESTIONNAIRE AND INTERVIEW RESPONSES: CHILE

TechTraPlastiCE - WP1 – FRAMEWORK

TAREAS 1 Y 2

Plásticos Artplas

Descripción: Es empresa especializada en la fabricación de productos plásticos 100% reciclados, comprometida con la sostenibilidad y la economía circular. Ofrece soluciones personalizadas como bolsas, film stretch y componentes industriales, todo elaborado a partir de materiales reciclados, promoviendo activamente el cuidado del medio ambiente en cada etapa de su producción.

CAPÍTULO 1

MARCO NORMATIVO: LEYES Y REGULACIONES NACIONALES E INTERNACIONALES RELACIONADAS CON PLÁSTICOS Y ECONOMÍA CIRCULAR

Objetivos:

- Identificar políticas públicas: programas gubernamentales y estrategias nacionales e internacionales relevantes.
- Identificar y analizar en las políticas factores: económicos, tecnológicos y sociales que influyen en la circularidad del plástico.

Preguntas clave a realizar a las empresas:

- **¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?**
Se hizo el proceso de certificación en la norma chilena 2909, además se cumplen normas medioambientales, en conjunto con eso tienen resolución sanitaria y de sanidad.
- **¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?**
Burocracia que lleva a cabo los trámites, retrasos y temas con tardanzas innecesario que hacen mucho más lento el proceso de mejorar las políticas de medioambiente.
- **¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?**
Sí, se pueden hacer convenios con grandes empresas para retirar sus excedentes de plásticos que luego son reutilizados en su área. También es beneficioso para la empresa, ya que las empresas necesitan asegurar que están trabajando certificados. (Es necesario resolución sanitaria y certificaciones).

CAPÍTULO 2

LA INDUSTRIA DEL PLÁSTICO A NIVEL NACIONAL

Objetivos:

- Analizar el estado del sector industrial del plástico en el país, considerando su estructura, tamaño y distribución, así como las aplicaciones finales más relevantes.
- Realizar la clasificación por tamaño de empresas y tipos de productos, distribución geográfica y económica del sector.

Preguntas clave a realizar a las empresas:

- **¿Cuál es el tamaño y tipo de empresa?**
Pequeña Empresa: 10 a 49 trabajadores
- **¿Dónde se encuentra ubicada la empresa?**
Dos sucursales, en Buin está el proceso productivo y en Maipú está la bodega de distribución.
- **¿Qué productos plásticos maneja y para qué tipo de aplicaciones?**
Mangas para regadío (agricultura), mangas para la construcción, bolsas para electrodomésticos con plásticos termo contraíbles (Trabajan con Winpol), para las bolsas de las maletas en los aeropuertos (diferentes colores para diferentes sectores), bolsas para las fábricas de hielo, manga para envoltorios muebles, entre otros.

CAPÍTULO 3

FACTORES Y ACTORES CLAVE EN LA TRANSICIÓN HACIA LA ECONOMÍA CIRCULAR

Objetivo:

- Identificar los factores determinantes (oportunidades, debilidades, barreras, fortalezas, desafíos, entre otros) que influyen en la transición del sector plástico hacia una economía circular.
- Comprender el rol de los actores clave: industria, gobierno, academia, sociedad civil y consumidores en el ecosistema del plástico y la economía circular.
- Examinar las relaciones entre factores y actores.

Preguntas clave a realizar a las empresas:

- **¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?**
Todo lo que es reciclaje, antes solo compraban material prima y ahora la procesan. Se retiran excedentes de plástico de las industrias, luego se seleccionan, se aglomeran, luego se filtra y se corta pequeño para que sea tratable, esa materia prima. Es la que se usa para hacer todos los productos. Identifican buena imagen para el cliente que trabaje con ellos y les asegura un proceso de economía circular.
- **¿Qué debilidades o barreras enfrenta su empresa en esta transición?**
Falta de incentivos del estado hacia la industria, los aranceles son más caros para tener una importación de materias primas vírgenes. Lo que nos hace menos competitivos frente a grandes industrias que tienen aranceles más bajos. El estado nos está poniendo (hace dos años) más restricciones impositivas, cosa que debería ser al revés.
- **¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?**
Son clave los clientes, los proveedores de materiales reciclados, las autoridades reguladoras y las empresas recolectoras de residuos.
¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?
No se están realizando.
- **¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?**
Destaca la producción de traversas para bins con plástico reciclado y el reciclaje de mangas plásticas, demostrando nuevas aplicaciones a partir de residuos post-industriales.
- **¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?**

Artplas enfoca sus procesos en el reciclaje y reutilización, alineándose con normas sobre reducción de plásticos de un solo uso y la Responsabilidad Extendida del Productor..

- **¿Qué acciones ha realizado frente a la prevención de la generación de residuos plásticos?**

Se promueve el uso de materiales reciclados, la reutilización de contenedores y productos y alternativas sustentables, buscando minimizar los desechos plásticos generados.

- **Si la empresa se relaciona con la producción de envases o empaques ¿se está trabajando en productos con materiales que permitan que sean usados varias veces, sin perjuicio de las condiciones de calidad?**

Se está plenamente comprometidos con el desarrollo de productos de envase y empaque que puedan ser reutilizados varias veces, sin que ello afecte las condiciones de calidad exigidas por nuestros clientes y el mercado. Nos hemos enfocado en utilizar materiales reciclados y diseñar soluciones que mantienen su integridad estructural y funcionalidad tras múltiples usos.

- **¿La empresa está incorporando en su proceso materiales reciclables o compostables?**

Sí, Plásticos Artplas utiliza materiales reciclados en la producción de varios productos y participa activamente en procesos de reciclaje del sector.

- **¿La empresa está haciendo uso de plástico reciclado en nuevos productos?**

Sí, la empresa destaca la fabricación de productos como bolsas y transversas para bins hechas con plástico reciclado.

TechTraPlastiCE - WP1 – FRAMEWORK TAREAS 1 Y 2

IKEA

Descripción: Empresa sueca de mobiliario, ha integrado fuertemente la sostenibilidad en su modelo de negocio, especialmente en relación con el plástico. Busca que para 2030 todos los plásticos que utilice sean reciclados o renovables, y ya ha eliminado el plástico de un solo uso en varios productos. Además, avanza en sustituir los plásticos en sus empaques para 2028 y ha desarrollado artículos hechos con botellas recicladas o materiales renovables como la caña de azúcar.

CAPÍTULO 1

MARCO NORMATIVO: LEYES Y REGULACIONES NACIONALES E INTERNACIONALES RELACIONADAS CON PLÁSTICOS Y ECONOMÍA CIRCULAR

Objetivos:

- Identificar políticas públicas: programas gubernamentales y estrategias nacionales e internacionales relevantes.
- Identificar y analizar en las políticas factores: económicos, tecnológicos y sociales que influyen en la circularidad del plástico.

Preguntas clave a realizar a las empresas:

- **¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?**
Fuerte foco en el desvío de vertederos, revalorización. se le da una segunda vida, cumplimiento legal es la base, regidos por ley de plástico de un solo uso y principalmente Ley Rep.
- **¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?**
Pocas barreras encontradas, pero en base a la ley, deficiencia de parte de los clientes, debido a falta de capacitación y concientización. Los trabajadores tienen constante capacitación.
- **¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?**
La base es la legalidad, sale mucho más eficiente y económicamente, desviar los residuos de vertederos, esto ya está comprobado en base a los años.

CAPÍTULO 2

LA INDUSTRIA DEL PLÁSTICO A NIVEL NACIONAL

Objetivos:

- Analizar el estado del sector industrial del plástico en el país, considerando su estructura, tamaño y distribución, así como las aplicaciones finales más relevantes.
- Realizar la clasificación por tamaño de empresas y tipos de productos, distribución geográfica y económica del sector.

Preguntas clave a realizar a las empresas:

- **¿Cuál es el tamaño y tipo de empresa?**
Gran Empresa: 200 o más trabajadores
- **¿Dónde se encuentra ubicada la empresa?**
Todo viene desde IKEA Global, No se cuenta con una Planta/Producción local, 2 tiendas y 1 centro de distribución, ubicada en las distintas zonas de la región metropolitana.
- **¿Qué productos plásticos maneja y para qué tipo de aplicaciones?**
Todos los productos están bajo una norma de sostenibilidad y reciclaje. Todos los productos y tipos de productos cuentan con distintos tipos de plástico (Productos de hogar, entre otros).

CAPÍTULO 3

FACTORES Y ACTORES CLAVE EN LA TRANSICIÓN HACIA LA ECONOMÍA CIRCULAR

Objetivo:

- Identificar los factores determinantes (oportunidades, debilidades, barreras, fortalezas, desafíos, entre otros) que influyen en la transición del sector plástico hacia una economía circular.
- Comprender el rol de los actores clave: industria, gobierno, academia, sociedad civil y consumidores en el ecosistema del plástico y la economía circular.
- Examinar las relaciones entre factores y actores.

Preguntas clave a realizar a las empresas:

- **¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?**
Desde el diseño del producto, es posible de revalorizarlo o darle un segundo uso, concepción de que los productos son basados en la circularidad. Centro de reparación para los productos del mismo IKEA, lo cual optimiza los procesos.
- **¿Qué debilidades o barreras enfrenta su empresa en esta transición?**
Se nota una ausencia en potenciar más el área comercial en el aspecto de circularidad, falta un mayor desarrollo para un mayor beneficio.
- **¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?**
Ikea Global y su incorporación de circularidad y sostenibilidad surge como el principal actor a la hora de llevar a cabos los procesos. Ya que todo deriva desde esa planta de producción principalmente, siempre las leyes gubernamentales surgen como un actor de actualización en ciertas normas del producto.
¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?
Primer acuerdo con institutos (proceso de transición), pero existe un contacto directo a través de los practicantes que son los encargados de nuevas ideas y generar mejoras.
- **¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?**
línea en la zona de oportunidades que genera IKEA, es su principal innovación, esto se aplica de forma global. El diseño de producto siempre orientado a la circularidad.
- **¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?**

IKEA ya no vive un proceso de adaptación, sino que se ve plenamente implementado las legislaciones básicas que se deben cumplir, siempre el sello de IKEA fue basado en estas normativas.

- **¿Qué acciones ha realizado frente a la prevención de la generación de residuos plásticos?**

Restaurante es con loza, utensilios compostables (platos , vasos , entre otros). Se evita el plástico de un solo uso.

- **Si la empresa se relaciona con la producción de envases o empaques ¿se está trabajando en productos con materiales que permitan que sean usados varias veces, sin perjuicio de las condiciones de calidad?**

Completamente, IKEA uno de sus sellos es el concepto de revalorización y que el producto cuente con más de un uso.

- **¿La empresa está incorporando en su proceso materiales reciclables o compostables?**

En todas sus líneas, IKEA mantiene en todas sus líneas el concepto de materiales de reciclaje, logrando ser una de las empresas más sostenibles del mundo.

- **¿La empresa está haciendo uso de plástico reciclado en nuevos productos?**

En todas sus líneas de Plástico, IKEA no solo en residuos asociados a plástico, sino que en todos. Pero en si todo lo fabricado es en base a plástico reciclable o reciclado.

TechTraPlastiCE - WP1 – FRAMEWORK TAREAS 1 Y 2

Reciclados industriales S.A

Descripción: Empresa pionera en el reciclaje integral de residuos sólidos no peligrosos tales como papeles, cartones, latas de aluminio, botellas de bebidas de PET, plásticos y envases de Tetrapak.

CAPÍTULO 1

MARCO NORMATIVO: LEYES Y REGULACIONES NACIONALES E INTERNACIONALES RELACIONADAS CON PLÁSTICOS Y ECONOMÍA CIRCULAR

Objetivos:

- Identificar políticas públicas: programas gubernamentales y estrategias nacionales e internacionales relevantes.
- Identificar y analizar en las políticas factores: económicos, tecnológicos y sociales que influyen en la circularidad del plástico.

Preguntas clave a realizar a las empresas:

- **¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?**
Respaldo de resolución sanitaria, tanto en la empresa como en los vehículos de recolección. Además de otorgar certificado de destrucción y disposición final de los residuos. Para asegurar la trazabilidad de los productos. Facilitando los datos para la declaración en SINADER.
- **¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?**
Lentitud de procesos administrativos, en general se demoran de 1-3 años para hacer algunos trámites, lo que los retrasa significativamente. Temas de burocracia en entidades públicas. Altos costos para llevar a cabo trámites importantes.
- **¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?**
Cuidado de medio ambiente, se aplica correctamente la reutilización de residuos. Acceso a certificaciones y nuevos mercados (exportamos lo que no se consume en el mercado interno al Caribe, centro americano y Asia pacifico).

CAPÍTULO 2

LA INDUSTRIA DEL PLÁSTICO A NIVEL NACIONAL

Objetivos:

- Analizar el estado del sector industrial del plástico en el país, considerando su estructura, tamaño y distribución, así como las aplicaciones finales más relevantes.
- Realizar la clasificación por tamaño de empresas y tipos de productos, distribución geográfica y económica del sector.

Preguntas clave a realizar a las empresas:

- **¿Cuál es el tamaño y tipo de empresa?**
Mediana Empresa: 50 a 199 trabajadores.
- **¿Dónde se encuentra ubicada la empresa?**
Av las torres #033, Maipú.
- **¿Qué productos plásticos maneja y para qué tipo de aplicaciones?**
Botellas PET (1). SIN TAPAS. CUALQUIER COLOR. Nosotros lo vendemos enfardados y se reutiliza principalmente para productos de envasado de alimentos.

CAPÍTULO 3

FACTORES Y ACTORES CLAVE EN LA TRANSICIÓN HACIA LA ECONOMÍA CIRCULAR

Objetivo:

- Identificar los factores determinantes (oportunidades, debilidades, barreras, fortalezas, desafíos, entre otros) que influyen en la transición del sector plástico hacia una economía circular.
- Comprender el rol de los actores clave: industria, gobierno, academia, sociedad civil y consumidores en el ecosistema del plástico y la economía circular.
- Examinar las relaciones entre factores y actores.

Preguntas clave a realizar a las empresas:

- **¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?**
Esencialmente expansión a mercados nuevos, ahora se produce para consumo interno, pero a largo plazo se puede exportar (actualmente cuando sobra estamos comenzando a exportar). Y la idea es abrir aún más el mercado, para consolidar la expansión de la empresa con mercados internacionales.
- **¿Qué debilidades o barreras enfrenta su empresa en esta transición?**
Se necesitan demasiados permisos que no son expeditos y son bastante costosos.
- **¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?**
El estado es el actor principal para facilitar trámites y que sean accesibles para expandir la industria de los residuos., solo a veces
¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?
No existe ningún convenio, solo a veces aceptan visitas de gente interesada en el tema de reciclaje.
- **¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?**
Enfardadoras automatizadas (todo el proceso, desde compactado hasta el amarre de los fardos) y cintas transportadoras. Para optimizar el proceso.
- **¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?**
Ya están del todo adaptados en sentido.
- **¿Qué acciones ha realizado frente a la prevención de la generación de residuos plásticos?**
No aplica, la única basura que producen son solo las bolsas de basura de la empresa como basura domiciliaria.

- **Si la empresa se relaciona con la producción de envases o empaques ¿se está trabajando en productos con materiales que permitan que sean usados varias veces, sin perjuicio de las condiciones de calidad?**
No aplica.
- **¿La empresa está incorporando en su proceso materiales reciclables o compostables?**
No aplica, ya están incorporando residuos a su producción.
- **¿La empresa está haciendo uso de plástico reciclado en nuevos productos?**
No, debido se dedica a procesar los residuos para el posterior reciclaje.

TechTraPlastiCE - WP1 – FRAMEWORK TAREAS 1 Y 2

Esquina Blanca SpA

Descripción: Es una empresa familiar, con sala de ventas y bodegas ubicadas en la comuna de Maipú, líder en la distribución y comercialización de productos desechables de plástico, plumavit, papel y cartón, así como también de productos reutilizables, biodegradables y compostables.

CAPÍTULO 1

MARCO NORMATIVO: LEYES Y REGULACIONES NACIONALES E INTERNACIONALES RELACIONADAS CON PLÁSTICOS Y ECONOMÍA CIRCULAR

Objetivos:

- Identificar políticas públicas: programas gubernamentales y estrategias nacionales e internacionales relevantes.
- Identificar y analizar en las políticas factores: económicos, tecnológicos y sociales que influyen en la circularidad del plástico.

Preguntas clave a realizar a las empresas:

- **¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?**
Desde que salió la ley REP, hemos intensificado la comercialización de productos ecológicos y compostables.
- **¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?**
Muy poca fiscalización, es poco accesible la oferta y suele ser mucho más caro en comparación al plástico de un solo uso. Aparte no existen sellos de certificación.
- **¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?**
Buena imagen de la empresa al cliente, pero aparte de eso nada más.

CAPÍTULO 2

LA INDUSTRIA DEL PLÁSTICO A NIVEL NACIONAL

Objetivos:

- Analizar el estado del sector industrial del plástico en el país, considerando su estructura, tamaño y distribución, así como las aplicaciones finales más relevantes.
- Realizar la clasificación por tamaño de empresas y tipos de productos, distribución geográfica y económica del sector.

Preguntas clave a realizar a las empresas:

- **¿Cuál es el tamaño y tipo de empresa?**
Microempresa: 1 a 9 trabajadores.
- **¿Dónde se encuentra ubicada la empresa?**
Esquina blanca #1087, Maipú.
- **¿Qué productos plásticos maneja y para qué tipo de aplicaciones?**
Envases plásticos para comida (diferentes recipientes) , recipientes para líquidos, bombillas, cubiertos.

CAPÍTULO 3

FACTORES Y ACTORES CLAVE EN LA TRANSICIÓN HACIA LA ECONOMÍA CIRCULAR

Objetivo:

- Identificar los factores determinantes (oportunidades, debilidades, barreras, fortalezas, desafíos, entre otros) que influyen en la transición del sector plástico hacia una economía circular.
- Comprender el rol de los actores clave: industria, gobierno, academia, sociedad civil y consumidores en el ecosistema del plástico y la economía circular.
- Examinar las relaciones entre factores y actores.

Preguntas clave a realizar a las empresas:

- **¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?**
Apertura de nuevos mercados, acceso a productos con certificación y aperturas a clientes conscientes con el medio ambiente.
- **¿Qué debilidades o barreras enfrenta su empresa en esta transición?**
Principalmente los precios muy pocos competitivos, muy poca oferta de productos y por ende baja demanda e interés por este tipo de artículos.
- **¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?**
El estado es un actor clave, los gremios asociados a estos temas para la expansión de mercados.
- **¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?**
De ninguna manera.
- **¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?**
Incorporación de productos ecológicos, contamos con una línea 100% ecológica certificada. Aparte para el empaque de productos evitamos lo mayor posible de no entregar plásticos de un solo uso.
- **¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?**
Al momento de salir la ley REP, de inmediato creamos la línea ecológica pero la oferta seguía siendo mayor para los productos de plástico de un solo uso por la poca competitividad en los precios.
- **¿Qué acciones ha realizado frente a la prevención de la generación de residuos plásticos?**

Hemos hechos a campañas por redes sociales respecto a uso consciente de productos ecológicos.

- **Si la empresa se relaciona con la producción de envases o empaques ¿se está trabajando en productos con materiales que permitan que sean usados varias veces, sin perjuicio de las condiciones de calidad?**

No somos productores, solo distribuimos.

- **¿La empresa está incorporando en su proceso materiales reciclables o compostables?**

Si, incorporamos línea ecológica pero no producimos.

- **¿La empresa está haciendo uso de plástico reciclado en nuevos productos?**

Solo en la línea ecológica y la parte de distribución.

TechTraPlastiCE - WP1 – FRAMEWORK TAREAS 1 Y 2

RECUPAC

Descripción: Recupac es una empresa chilena dedicada al reciclaje y la gestión de residuos, con énfasis en la economía circular. Procesa más de 150.000 toneladas al año y colabora con compañías como Nestlé y Coca-Cola Andina para fomentar la sostenibilidad y cumplir la Ley REP.

CAPÍTULO 1

MARCO NORMATIVO: LEYES Y REGULACIONES NACIONALES E INTERNACIONALES RELACIONADAS CON PLÁSTICOS Y ECONOMÍA CIRCULAR

Objetivos:

- Identificar políticas públicas: programas gubernamentales y estrategias nacionales e internacionales relevantes.
- Identificar y analizar en las políticas factores: económicos, tecnológicos y sociales que influyen en la circularidad del plástico.

Preguntas clave a realizar a las empresas:

- **¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?**
Construimos una planta de última tecnología para el lavado y reciclaje de plásticos flexibles (PEBD principalmente), con el objeto de contribuir con un modelo a escala industrial a la circularidad de los embalajes plásticos.
- **¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?**
A mi forma de ver, el principal desafío/oportunidad que tenemos como país tiene que ver con el incentivo a usar materias primas recicladas en los embalajes y/o productos plásticos o el desincentivo de utilizar materias primas vírgenes, tal como hoy ocurre en varios países de Europa.
- **¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?**
Incentivos económicos de distintos tipos, para generar una inversión de proyectos en capital.

CAPÍTULO 2

LA INDUSTRIA DEL PLÁSTICO A NIVEL NACIONAL

Objetivos:

- Analizar el estado del sector industrial del plástico en el país, considerando su estructura, tamaño y distribución, así como las aplicaciones finales más relevantes.
- Realizar la clasificación por tamaño de empresas y tipos de productos, distribución geográfica y económica del sector.

Preguntas clave a realizar a las empresas:

- **¿Cuál es el tamaño y tipo de empresa?**
Mediana Empresa: 50 a 199 trabajadores.
- **¿Dónde se encuentra ubicada la empresa?**
Tenemos 5 plantas en la RM y V región.
- **¿Qué productos plásticos maneja y para qué tipo de aplicaciones?**
pellets plásticos para la fabricación de films, mangas, bolsas entre otros.

CAPÍTULO 3

FACTORES Y ACTORES CLAVE EN LA TRANSICIÓN HACIA LA ECONOMÍA CIRCULAR

Objetivo:

- Identificar los factores determinantes (oportunidades, debilidades, barreras, fortalezas, desafíos, entre otros) que influyen en la transición del sector plástico hacia una economía circular.
- Comprender el rol de los actores clave: industria, gobierno, academia, sociedad civil y consumidores en el ecosistema del plástico y la economía circular.
- Examinar las relaciones entre factores y actores.

Preguntas clave a realizar a las empresas:

- **¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?**
Venta de packaging que incorpora materias primas recicladas.
- **¿Qué debilidades o barreras enfrenta su empresa en esta transición?**
La complejidad y lentitud para contar con permisos para desarrollar proyectos, la incertidumbre del contexto macroeconómico para el desarrollo de inversiones.
- **¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?**
SEIA, Ministerio de Salud, Ministerio de Medio Ambiente, las empresas (áreas de sostenibilidad y procurement).
- **¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?**
Tenemos un área de innovación que se relaciona con universidades y startups llamada La Fragua.
- **¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?**
Además de las materias primas que vendemos, reemplazamos los maxisacos de PP virgen, por maxibolsas de polietileno reciclado.
- **¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), ¿entre otras)?**
Estamos acompañando a nuestros clientes en temas de Ley REP.
- **¿Qué acciones ha realizado frente a la prevención de la generación de residuos plásticos?**
No aplica.
- **Si la empresa se relaciona con la producción de envases o empaques ¿se está trabajando en productos con materiales que permitan que sean usados varias veces, sin perjuicio de las condiciones de calidad?**

Si.

- **¿La empresa está incorporando en su proceso materiales reciclables o compostables?**

Si, integramos materiales reciclables en sus procesos y servicios

- **¿La empresa está haciendo uso de plástico reciclado en nuevos productos?**

Si, se utiliza plástico reciclado en la creación de nuevos productos, como el pellet de polietileno de baja densidad (PEBD), producido en su planta de valorización de San Bernardo.

TechTraPlastiCE - WP1 – FRAMEWORK TAREAS 1 Y 2

Patio Parque SpA

Descripción: Patio Parque SpA complementa su oferta de desarrollo y gestión de espacios urbanos con la fabricación y comercialización de equipamiento para juegos infantiles, destacando productos como toboganes, paneles de HDPE, columpios y superficies de caucho EPDM y SBR. Estos elementos están diseñados para crear entornos seguros, innovadores y atractivos para el juego de los niños, tanto en plazas públicas como en jardines infantiles y espacios recreativos privados.

CAPÍTULO 1

MARCO NORMATIVO: LEYES Y REGULACIONES NACIONALES E INTERNACIONALES RELACIONADAS CON PLÁSTICOS Y ECONOMÍA CIRCULAR

Objetivos:

- Identificar políticas públicas: programas gubernamentales y estrategias nacionales e internacionales relevantes.
- Identificar y analizar en las políticas factores: económicos, tecnológicos y sociales que influyen en la circularidad del plástico.

Preguntas clave a realizar a las empresas:

- **¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?**
Certificación ISO 14001.
- **¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?**
El sistema no está preparado aún para facilitar todos los procesos asociados a la circularidad del plástico. No existen apoyos reales que faciliten la gestión para llevar a cabo iniciativas y mucho menos facilitar el trabajo a quienes pretenden liderar la innovación en los distintos procesos para este tipo de desafíos. CORFO NO BASTA.
- **¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?**
Principalmente apoyo económico para el desarrollo de nuevos procesos para reciclar plástico y transformarlo en nuevos productos. En este caso productos urbanos de mediana escala.

CAPÍTULO 2

LA INDUSTRIA DEL PLÁSTICO A NIVEL NACIONAL

Objetivos:

- Analizar el estado del sector industrial del plástico en el país, considerando su estructura, tamaño y distribución, así como las aplicaciones finales más relevantes.
- Realizar la clasificación por tamaño de empresas y tipos de productos, distribución geográfica y económica del sector.

Preguntas clave a realizar a las empresas:

- **¿Cuál es el tamaño y tipo de empresa?**
- Microempresa: 1 a 9 trabajadores.
- **¿Dónde se encuentra ubicada la empresa?**
Quilicura.
- **¿Qué productos plásticos maneja y para qué tipo de aplicaciones?**
Toboganes, paneles HDPE, columpios, caucho EPDM y SBR. Aplicaciones para Juegos Infantiles.

CAPÍTULO 3

FACTORES Y ACTORES CLAVE EN LA TRANSICIÓN HACIA LA ECONOMÍA CIRCULAR

Objetivo:

- Identificar los factores determinantes (oportunidades, debilidades, barreras, fortalezas, desafíos, entre otros) que influyen en la transición del sector plástico hacia una economía circular.
- Comprender el rol de los actores clave: industria, gobierno, academia, sociedad civil y consumidores en el ecosistema del plástico y la economía circular.
- Examinar las relaciones entre factores y actores.

Preguntas clave a realizar a las empresas:

- **¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?**
Desarrollo de nuevos procesos productivos para la creación de nuevos productos.
- **¿Qué debilidades o barreras enfrenta su empresa en esta transición?**
Ser una empresa nueva dificulta la postulación a fondos concursables.
- **¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?**
El sistema se nutre de muchos actores para generar una transición, pero uno de los más importantes está en el consumidor. Los procesos encarecen los productos y estos dejan de ser competitivos respecto de los productos con plásticos vírgenes.
- **¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?**
Postulaciones a fondos concursables, principalmente.
- **¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?**
Ninguna, hasta ahora.
- **¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?**
Compra de productos reciclados y reciclables.
- **¿Qué acciones ha realizado frente a la prevención de la generación de residuos plásticos?**
Innovación en procesos de producción con plásticos reciclados.
- **Si la empresa se relaciona con la producción de envases o empaques ¿se está trabajando en productos con materiales que permitan que sean usados varias veces, sin perjuicio de las condiciones de calidad?**
No aplica.
- **¿La empresa está incorporando en su proceso materiales reciclables o compostables?**

Si, El uso de plásticos reciclados y la incorporación de materiales reutilizables forman parte de nuestras buenas prácticas para reducir el impacto ambiental y cerrar el ciclo de los materiales plásticos utilizados en sus productos y servicios.

- **¿La empresa está haciendo uso de plástico reciclado en nuevos productos?**

Si, El plástico recuperado es transformado y reutilizado, cumpliendo así los objetivos de economía circular y reducción de residuos en la industria.

TechTraPlastiCE - WP1 – FRAMEWORK TAREAS 1 Y 2

COMERCIAL LML S.A.

Descripción: Comercial LML S.A. es una recuperadora de envases industriales que promueve la conciencia sobre el reciclaje en Chile, contribuyendo directamente a una economía circular con la producción de envases metálicos, tambores plásticos, bidones y estanques IBC.

CAPÍTULO 1

MARCO NORMATIVO: LEYES Y REGULACIONES NACIONALES E INTERNACIONALES RELACIONADAS CON PLÁSTICOS Y ECONOMÍA CIRCULAR

Objetivos:

- Identificar políticas públicas: programas gubernamentales y estrategias nacionales e internacionales relevantes.
- Identificar y analizar en las políticas factores: económicos, tecnológicos y sociales que influyen en la circularidad del plástico.

Preguntas clave a realizar a las empresas:

- **¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?**
Han aplicado la ley REP y todas las regulaciones impuestas por SEREMI y Ministerio del medio ambiente.
- **¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?**
En general temas relacionados a la burocracia, la demora y complejidad en tramitaciones de autorizaciones y resoluciones.
- **¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?**
En general, facilidad para entrar con la gestión del residuo, prestigio y mayor valor del servicio.

CAPÍTULO 2

LA INDUSTRIA DEL PLÁSTICO A NIVEL NACIONAL

Objetivos:

- Analizar el estado del sector industrial del plástico en el país, considerando su estructura, tamaño y distribución, así como las aplicaciones finales más relevantes.
- Realizar la clasificación por tamaño de empresas y tipos de productos, distribución geográfica y económica del sector.

Preguntas clave a realizar a las empresas:

- **¿Cuál es el tamaño y tipo de empresa?**
- Mediana Empresa: 50 a 199 trabajadores.
- **¿Dónde se encuentra ubicada la empresa?**
- Avenida General Velásquez 2958, San Bernardo.
- **¿Qué productos plásticos maneja y para qué tipo de aplicaciones?**
Envases plásticos (no domiciliarios) industriales de 5 a 1000lts.

CAPÍTULO 3

FACTORES Y ACTORES CLAVE EN LA TRANSICIÓN HACIA LA ECONOMÍA CIRCULAR

Objetivo:

- Identificar los factores determinantes (oportunidades, debilidades, barreras, fortalezas, desafíos, entre otros) que influyen en la transición del sector plástico hacia una economía circular.
- Comprender el rol de los actores clave: industria, gobierno, academia, sociedad civil y consumidores en el ecosistema del plástico y la economía circular.
- Examinar las relaciones entre factores y actores.

Preguntas clave a realizar a las empresas:

- **¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?**
Las pocas empresas que se dedican a este rubro.
- **¿Qué debilidades o barreras enfrenta su empresa en esta transición?**
No identificamos barreras, llevamos 40 años en el negocio, por lo que no estamos en transición.
- **¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?**
No estamos en transición, hacemos economía circular y cumplimos con la normativa hace más de 20 años.
- **¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?**
No hay relación con casas de estudio.
- **¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?**
Dar cumplimiento a medidas de control e invertir en asesorías de medio ambiente.
- **¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), ¿entre otras)?**
No estamos en adaptación, ya estamos 100% dando cumplimiento a la normativa.
- **¿Qué acciones ha realizado frente a la prevención de la generación de residuos plásticos?**
Nosotros no generamos residuos plásticos.
- **Si la empresa se relaciona con la producción de envases o empaques ¿se está trabajando en productos con materiales que permitan que sean usados varias veces, sin perjuicio de las condiciones de calidad?**
No fabricamos envases nuevos, nosotros nos dedicamos a reacondicionar (economía circular).

- **¿La empresa está incorporando en su proceso materiales reciclables o compostables?**
En esta empresa se encargan de reacondicionar, no de fabricar.
- **¿La empresa está haciendo uso de plástico reciclado en nuevos productos?**
En esta empresa se encargan de reacondicionar, no de fabricar.

TechTraPlastiCE - WP1 – FRAMEWORK TAREAS 1 Y 2

RECICLAPP

Descripción: Reciclapp es una empresa chilena que facilita el reciclaje domiciliario y empresarial a través de una aplicación móvil. Su principal objetivo es conectar a personas que desean reciclar con recicladores que retiran materiales directamente desde sus hogares, oficinas o comunidades.

CAPÍTULO 1

MARCO NORMATIVO: LEYES Y REGULACIONES NACIONALES E INTERNACIONALES RELACIONADAS CON PLÁSTICOS Y ECONOMÍA CIRCULAR

Objetivos:

- Identificar políticas públicas: programas gubernamentales y estrategias nacionales e internacionales relevantes.
- Identificar y analizar en las políticas factores: económicos, tecnológicos y sociales que influyen en la circularidad del plástico.

Preguntas clave a realizar a las empresas:

- **¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?**
Somos articuladores de gestores de residuos, donde creamos planes de gestión de residuos desde la separación en origen hasta la transformación final y su posterior certificación.
- **¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?**
El impacto económico (Ley PUSU), poca disponibilidad de proveedores con certificación local, disponibilidad de entidades trazadoras de residuos.
- **¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?**
El ahorro de posibles multas, acciones de marketing para acercar propósito de la empresa con los lineamientos del nuevo tipo de consumidor más responsable con sus residuos.

CAPÍTULO 2

LA INDUSTRIA DEL PLÁSTICO A NIVEL NACIONAL

Objetivos:

- Analizar el estado del sector industrial del plástico en el país, considerando su estructura, tamaño y distribución, así como las aplicaciones finales más relevantes.
- Realizar la clasificación por tamaño de empresas y tipos de productos, distribución geográfica y económica del sector.
- Definir la cadena de valor del plástico "establecer el ecosistema del plástico".

Preguntas clave a realizar a las empresas:

- **¿Cuál es el tamaño y tipo de empresa?**
Pequeña Empresa: 10 a 49 trabajadores
- **¿Dónde se encuentra ubicada la empresa?**
Oficina en Santiago Centro
- **¿Qué productos plásticos maneja y para qué tipo de aplicaciones?**
Todos los tipos excepto Plástico tipo 3 y 7

CAPÍTULO 3

FACTORES Y ACTORES CLAVE EN LA TRANSICIÓN HACIA LA ECONOMÍA CIRCULAR

Objetivo:

- Identificar los factores determinantes (oportunidades, debilidades, barreras, fortalezas, desafíos, entre otros) que influyen en la transición del sector plástico hacia una economía circular.
- Comprender el rol de los actores clave: industria, gobierno, academia, sociedad civil y consumidores en el ecosistema del plástico y la economía circular.
- Examinar las relaciones entre factores y actores.

Preguntas clave a realizar a las empresas:

- **¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?**
No aplica. Somos una empresa que su core business es la economía circular. Esta pregunta imagino aplica a los generadores o productores de envases y generadores de potenciales residuos.
- **¿Qué debilidades o barreras enfrenta su empresa en esta transición?**
El desconocimiento del mercado y que los generadores asuman el costo de la recolección y valorización de residuos.
- **¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?**
Gestores de residuos de todos los tamaños.
- **¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?**
Solo hemos establecido acuerdos comerciales con universidades. No hemos trabajado proyectos o estudios en conjunto.
- **¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?**
No aplica.
- **¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?**
Somos articuladores de gestores. Participamos en licitaciones para gestionar residuos en las comunas donde se emplacen los GRANSIC y también como consultores de ambos GRANSIC de EyE.
- **¿Qué acciones ha realizado frente a la prevención de la generación de residuos plásticos?**
Propuestas de reuso y retornabilidad. Tenemos un proyecto actual con Coca Cola.

- **Si la empresa se relaciona con la producción de envases o empaques ¿se está trabajando en productos con materiales que permitan que sean usados varias veces, sin perjuicio de las condiciones de calidad?**
No aplica.
- **¿La empresa está incorporando en su proceso materiales reciclables o compostables?**
No aplica.
- **¿La empresa está haciendo uso de plástico reciclado en nuevos productos?**
No aplica.

TechTraPlastiCE - WP1 – FRAMEWORK TAREAS 1 Y 2

GREENDOT SPA

Descripción: Empresa chilena encargada de la valorización de residuos plásticos industriales y postindustriales, especialmente provenientes del sector acuícola. Trabaja con plásticos como polietileno (PE), polipropileno (PP) y poliestireno (PS), transformándolos en productos reciclados como pallets, mobiliario urbano, y otros insumos reutilizables. Su enfoque está en la economía circular, reintegrando residuos plásticos al ciclo productivo de forma sustentable.

CAPÍTULO 1

MARCO NORMATIVO: LEYES Y REGULACIONES NACIONALES E INTERNACIONALES RELACIONADAS CON PLÁSTICOS Y ECONOMÍA CIRCULAR

Objetivos:

- Identificar políticas públicas: programas gubernamentales y estrategias nacionales e internacionales relevantes.
- Identificar y analizar en las políticas factores: económicos, tecnológicos y sociales que influyen en la circularidad del plástico.

Preguntas clave a realizar a las empresas:

- **¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?**
Realizamos el pretratamiento de plásticos industriales y domiciliarios, siempre alienados con el cumplimiento de la Ley Rep.
- **¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?**
Realizar una gestión con empresas formales y autorizadas para el manejo de residuos.
- **¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?**
Resguardarse ante las entidades fiscalizadoras.

CAPÍTULO 2

LA INDUSTRIA DEL PLÁSTICO A NIVEL NACIONAL

Objetivos:

- Analizar el estado del sector industrial del plástico en el país, considerando su estructura, tamaño y distribución, así como las aplicaciones finales más relevantes.
- Realizar la clasificación por tamaño de empresas y tipos de productos, distribución geográfica y económica del sector.
- Definir la cadena de valor del plástico "establecer el ecosistema del plástico".

Preguntas clave a realizar a las empresas:

- **¿Cuál es el tamaño y tipo de empresa?**
Mediana Empresa: 50 a 199 trabajadores
- **¿Dónde se encuentra ubicada la empresa?**
Alto Jahuel 0381, Buin
- **¿Qué productos plásticos maneja y para qué tipo de aplicaciones?**
PET, PEAD, PEBD, PP / Se vende a valorizadores que convierten en pellet.

CAPÍTULO 3

FACTORES Y ACTORES CLAVE EN LA TRANSICIÓN HACIA LA ECONOMÍA CIRCULAR

Objetivo:

- Identificar los factores determinantes (oportunidades, debilidades, barreras, fortalezas, desafíos, entre otros) que influyen en la transición del sector plástico hacia una economía circular.
- Comprender el rol de los actores clave: industria, gobierno, academia, sociedad civil y consumidores en el ecosistema del plástico y la economía circular.
- Examinar las relaciones entre factores y actores.

Preguntas clave a realizar a las empresas:

- **¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?**
Muchas oportunidades de generar valor, pero es difícil integrarse. Las empresas prefieren dedicarse a uno o dos eslabones de la cadena de reciclaje. Se pueden producir varios productos que generen valor, el problema es que suelen ser más costosos que los productos producidos con material virgen.
- **¿Qué debilidades o barreras enfrenta su empresa en esta transición?**
Nuestra empresa no cuenta con el proceso de valorización, la barrera es el riesgo que implica una operación así desde el punto de vista de seguridad y alto costo de inversión en maquinaria.
- **¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?**
El resto de los gestores y valorizadores formales.
- **¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?**
En ningún ámbito.
- **¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?**
Ninguna.
- **¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?**
Estamos 100% adaptados y reportamos nuestras gestiones a los sistemas de gestión. Aun no somos parte de un ecosistema para productores de productos prioritarios, de todas maneras.
- **¿Qué acciones ha realizado frente a la prevención de la generación de residuos plásticos?**
Solo a nivel personal, como empresa no controlamos el consumo de nuestros clientes.

- **Si la empresa se relaciona con la producción de envases o empaques ¿se está trabajando en productos con materiales que permitan que sean usados varias veces, sin perjuicio de las condiciones de calidad?**
No producimos envases o embalajes.
- **¿La empresa está incorporando en su proceso materiales reciclables o compostables?**
No.
- **¿La empresa está haciendo uso de plástico reciclado en nuevos productos?**
No.

TechTraPlastiCE - WP1 – FRAMEWORK TAREAS 1 Y 2

QACTUS

Descripción: Empresa chilena Qactus transforma plástico reciclado en productos personalizados mediante impresión 3D, promoviendo la economía circular y la sustentabilidad.

CAPÍTULO 1

MARCO NORMATIVO: LEYES Y REGULACIONES NACIONALES E INTERNACIONALES RELACIONADAS CON PLÁSTICOS Y ECONOMÍA CIRCULAR

Objetivos:

- Identificar políticas públicas: programas gubernamentales y estrategias nacionales e internacionales relevantes.
- Identificar y analizar en las políticas factores: económicos, tecnológicos y sociales que influyen en la circularidad del plástico.

Preguntas clave a realizar a las empresas:

- **¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?**
Ninguna en concreto, solo trabajan con empresas que tratan los residuos plásticos con buenas prácticas.
- **¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?**
En general el capital inicial que se necesita debido a que se es necesario una inversión inicial considerable. Aparte de lo complejo que es encontrar proveedores que tengas y comercialicen estas tecnologías.
- **¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?**
En general, te ayuda con el marketing porque hay gente que busca empresas con buenas prácticas y ese es un aspecto diferenciador ante otras empresas.

CAPÍTULO 2

LA INDUSTRIA DEL PLÁSTICO A NIVEL NACIONAL

Objetivos:

- Analizar el estado del sector industrial del plástico en el país, considerando su estructura, tamaño y distribución, así como las aplicaciones finales más relevantes.
- Realizar la clasificación por tamaño de empresas y tipos de productos, distribución geográfica y económica del sector.

Preguntas clave a realizar a las empresas:

- **¿Cuál es el tamaño y tipo de empresa?**
Pequeña Empresa: 10 a 49 trabajadores
- **¿Dónde se encuentra ubicada la empresa?**
Providencia - Santiago
- **¿Qué productos plásticos maneja y para qué tipo de aplicaciones?**
Filamentos de plástico, en específico para utilizarlos en impresiones 3D

CAPÍTULO 3

FACTORES Y ACTORES CLAVE EN LA TRANSICIÓN HACIA LA ECONOMÍA CIRCULAR

Objetivo:

- Identificar los factores determinantes (oportunidades, debilidades, barreras, fortalezas, desafíos, entre otros) que influyen en la transición del sector plástico hacia una economía circular.
- Comprender el rol de los actores clave: industria, gobierno, academia, sociedad civil y consumidores en el ecosistema del plástico y la economía circular.
- Examinar las relaciones entre factores y actores.

Preguntas clave a realizar a las empresas:

- **¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?**
Si, el embalaje sigue la línea sustentable.
- **¿Qué debilidades o barreras enfrenta su empresa en esta transición?**
La inversión que requiere y para seguir renovándose es una inversión constante.
- **¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?**
Todos los actores de la cadena productiva son clave, las personas con buenas prácticas son las que se consideran como actores clave. El gobierno impulsa a que se adopten este tipo de práctica.
- **¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?**
No mucho, pero tiene voluntad de compartir su experiencia. Pero se considera de bajo impacto, la colaboración no es tan concreta.
- **¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?**
Lo más directos es haber logrado transformar el plástico reciclado en un recurso para hacer impresiones 3D.
- **¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?**
Son cuidadosos en los proveedores que utilizan en el carbono, se rigen por índices como huellas de carbono, entre otros.
- **¿Qué acciones ha realizado frente a la prevención de la generación de residuos plásticos?**
Nada se sobre produce, el stock depende de la demanda y si algo sale de forma diferente se reincorpora los materiales, existen también algunas donaciones que se hacen. Esto debido para fomentar la cadena de conocía circular e infraestructuras, generan contactos con otras empresas entre otras prácticas.

- **Si la empresa se relaciona con la producción de envases o empaques ¿se está trabajando en productos con materiales que permitan que sean usados varias veces, sin perjuicio de las condiciones de calidad?**
Si, el embalaje sigue la línea sustentable.
- **¿La empresa está incorporando en su proceso materiales reciclables o compostables?**
Siempre, Qactus se basa en la producción de esto.
- **¿La empresa está haciendo uso de plástico reciclado en nuevos productos?**
Qactus basa su producción en plásticos reciclados.

**TechTraPlastiCE - WP1 – FRAMEWORK
TAREAS 1 Y 2**

FICHA LEVANTAMIENTO DE INFORMACIÓN

Responsable de la entrevista

Fecha:		Universidad:	Pontificia Universidad Católica de Valparaíso (PUCV)
Responsable:	Sandra Ponce		

Información de la empresa

Razón social:	Alimentos y Cebidas de Chile A.G.		
Dirección:	Los Militares 6191, oficina 71. Las Condes, Santiago		
Nombre de contacto:	Carolina Pizarro	Cargo:	Gerente Sustentabilidad
Correo electrónico:	cpizarro@abchile.com	Teléfono:	2 2307 0609

Descripción de la empresa

Rubro:	Industria Alimentaria. Es una asociación gremial que representa a las empresas productoras de alimentos y bebidas en Chile. Su principal objetivo es promover la industria alimentaria chilena, destacando la innovación, sostenibilidad y responsabilidad. La asociación se enfoca en defender los intereses de sus socios, comunicar sus actividades y desarrollar relaciones con centros de investigación.
Tamaño (indicar aproximado de ventas anuales):	-
Ubicación(es), si tiene más de una sucursal a nivel nacional e internacional	Sucursal Nacional. Dirección Los Militares 6191, oficina 71. Las Condes, Santiago
¿Qué productos plásticos maneja y para qué tipo de aplicaciones?	Alimentos y Bebidas de Chile A.G. maneja varios tipos de plásticos, principalmente PET, PEAD y PP, para una amplia gama de aplicaciones en el sector alimentario y de bebidas, incluyendo envases de alimentos, botellas y tapas, entre otros

Factores y actores clave en la transición hacia la Economía Circular

- a. ¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?
- b. ¿Qué debilidades o barreras enfrenta su empresa en esta transición?
- c. ¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?
- d. ¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?
- e. ¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?
- f. ¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?

1. ¿Qué oportunidades existen para fomentar la economía circular en el sector plástico?

Chile tiene una gran oportunidad de liderar en economía circular gracias a la implementación de marcos normativos como la Ley REP (Ley de Responsabilidad Extendida del Productor) y la Ley de Plásticos de Un Solo Uso. Estas normativas establecen metas concretas de recolección y reciclaje, incentivando a las empresas a rediseñar productos con materiales sostenibles y reciclables.

En 2018 inició el proceso para la creación del primer GRANSIC para envases y embalajes con el objetivo de cumplir con la ley REP, hoy conocido como ReSimple. En ese sentido, AB Chile ha impulsado con convicción la necesidad de cumplir con las obligaciones de esta ley.

La innovación tecnológica también es una oportunidad clave. Inversiones como las plantas "botella a botella" de CCU y Coca-Cola, con una inversión aproximada de 80 millones USD, demuestran el potencial de tecnologías avanzadas para transformar los residuos plásticos en nuevos productos. Además, el creciente interés por los bioplásticos y envases compostables abre nuevos mercados para materiales más sostenibles.

2. ¿Qué debilidades o barreras enfrentan las empresas locales en esta transición?

Se han detectado barreras significativas en la transición hacia una economía circular; por ejemplo, ya a más de un año de implementación de la Ley REP, aún se podría hablar de una infraestructura insuficiente, donde la capacidad de reciclaje en Chile es limitada y está concentrada en regiones específicas, como la Metropolitana, dejando a otras áreas sin acceso adecuado. Por otra parte, se puede citar que los materiales reciclados suelen ser más caros que los vírgenes debido a los costos asociados con la recolección, separación y procesamiento. Esto desincentiva la adopción de prácticas sostenibles. Fomentar el mercado del plástico reciclado es fundamental por varias

razones, no solo desde el punto de vista ambiental como económico y social; si no que será un real incentivo (directo/indirecto) para cumplimiento de metas REP.

Existen también desafíos regulatorios y normativos, específicamente la coexistencia de la Ley REP y la Ley PUSU puede generar conflictos en la gestión de ciertos materiales, como el PET, lo que dificulta el cumplimiento de sus respectivas metas. La convivencia de estas dos normativas que no fueron diseñadas para ser compatibles, y que estresan la disponibilidad de plástico, es sin duda uno de los grandes desafíos que se enfrenta en materia de gestión de residuos y, en particular, de botellas en el corto plazo.

Finalmente, varias encuestas realizadas en el último tiempo (Barómetro de Reciclaje / Reciclando Ando) han corroborado una baja participación ciudadana, dónde persisten mitos sobre el reciclaje y falta de educación ambiental, lo que limita la eficacia de las iniciativas circulares.

3. ¿Qué actores son clave para impulsar la economía circular en el sector plástico?

La transición hacia una economía circular en el sector plástico, y específicamente en el packaging para la industria alimentaria, depende de la colaboración activa de diversos actores clave, cada uno desempeñando un rol fundamental para lograr una transformación sostenible.

En primer lugar, el Estado y el sector público juegan un papel central a través del liderazgo del Ministerio del Medio Ambiente. Este organismo ha sido responsable de diseñar e implementar políticas públicas clave, como la Ley REP y la Hoja de Ruta para la Economía Circular 2040, que establecen un marco normativo sólido para fomentar prácticas sostenibles. Además, el gobierno es el principal responsable de impulsar campañas educativas y de sensibilización para promover una cultura de reciclaje y economía circular en la ciudadanía.

El sector privado también es un actor crucial y parte importante del ecosistema. Por ejemplo, las empresas de alimentos y bebidas han adoptado medidas significativas para alinearse con los principios de la economía circular. Estas incluyen metas de "cero residuos" en sus procesos de producción, la implementación de prácticas como la agricultura regenerativa y el diseño de nuevos materiales para envases que sean sostenibles y eficientes. Estas iniciativas no solo reflejan un compromiso con la sostenibilidad, sino que también demuestran cómo el sector privado puede liderar inversiones en reciclaje y ecodiseño para transformar sus operaciones.

La academia aporta su experiencia en investigación y desarrollo tecnológico, actuando como puente entre el conocimiento científico y su aplicación en la industria. Universidades como la Pontificia Universidad Católica de Valparaíso (PUCV) colaboran con el sector privado en proyectos innovadores, desarrollando tecnologías avanzadas para el reciclaje y facilitando la transferencia de conocimientos que contribuyen al avance de la economía circular.

Finalmente, la sociedad civil, a través de ONGs y fundaciones, desempeña un rol esencial al sensibilizar a la ciudadanía sobre la importancia del reciclaje y fomentar la adopción de prácticas sostenibles.

4. ¿Cómo interactúan los actores entre sí y con los factores que influyen en la economía circular?

Resulta fundamental definir objetivos comunes a nivel nacional y que todos los actores involucrados, desde investigadores hasta empresas y gobiernos, compartan una visión clara y metas específicas en cuanto a la economía circular, y específicamente en el sector que represento, Alimentos y Bebidas, esta es clave para la sostenibilidad alimentaria. Fomentar una mayor colaboración entre diferentes actores para lograr una producción de alimentos más sostenible, requiere un enfoque coordinado y estratégico. En ese marco, la tecnología y la innovación no sólo son respuestas a los desafíos actuales de la sostenibilidad alimentaria, sino que son también motores de cambio que pueden transformar la industria. Al integrar estos avances con políticas públicas en torno a la economía circular y con un esfuerzo colectivo de gobierno, industria y ciudadanía, es posible avanzar hacia una producción de alimentos que sea verdaderamente sostenible y eficiente.

La interacción entre actores idealmente debería estar mediada por proyectos de colaboración público-privada y la implementación de normativas. Por ejemplo, que universidades trabajen con empresas para desarrollar soluciones innovadoras en reciclaje, mientras que el estado regule y monitoree el cumplimiento de las metas establecidas

Además, en conjunto y de manera colaborativa tanto el sector público como el privado desempeñan un rol crucial en educar a la ciudadanía y consumidores sobre la importancia del reciclaje y fomentar la demanda de productos sostenibles.

5. ¿Qué políticas o estrategias podrían fortalecer estas relaciones?

Para fortalecer las relaciones entre los diferentes actores involucrados en la economía circular del sector plástico específicamente vinculado a la industria de alimentos y bebidas, es crucial implementar políticas y estrategias que aborden los desafíos actuales y fomenten una colaboración más efectiva. En primer lugar, incentivos económicos, como los proyectos de reducción y/o créditos verdes, son fundamentales para reducir los costos asociados con la adopción de tecnologías sostenibles. Estas herramientas permitirían a las empresas realizar inversiones en innovación tecnológica y en la mejora de sus procesos productivos, haciendo más accesible la transición hacia un modelo de economía circular.

Además, la ampliación de la infraestructura de reciclaje es una prioridad para descentralizar el procesamiento de residuos plásticos. Esto implica la inversión en la construcción de plantas de reciclaje en regiones periféricas, reduciendo las desigualdades en la capacidad de gestión de residuos entre distintas áreas del país. Una infraestructura más equilibrada permitiría aumentar las tasas de reciclaje a nivel nacional y facilitar el acceso a servicios de gestión de residuos en comunidades actualmente desatendidas.

Las campañas educativas también juegan un papel esencial. Es necesario fomentar una mayor participación ciudadana mediante programas de educación ambiental que comiencen desde edades tempranas. Estas iniciativas no solo aumentarán la conciencia

pública sobre la importancia del reciclaje, sino que también promoverán hábitos sostenibles y una cultura de responsabilidad ambiental entre los consumidores.

Finalmente, el fortalecimiento de la ecomodulación es una estrategia clave para incentivar prácticas sostenibles en el diseño de productos. La implementación de criterios claros que ajusten los costos de gestión de residuos según la reciclabilidad de los materiales promoverá la fabricación de productos más amigables con el medio ambiente. A su vez, penalizar los materiales de difícil tratamiento desincentivará su uso, alineando las prácticas empresariales con los principios de la economía circular.

En conjunto, estas políticas y estrategias tienen el potencial de mejorar significativamente las relaciones y la coordinación entre los actores clave, desde el gobierno hasta las empresas, la academia y la ciudadanía, facilitando el avance hacia un modelo económico más sostenible.

6. ¿Cómo se está adaptando la industria (del plástico) a la Ley REP?

La industria ha mostrado avances significativos. ReSimple, el primer sistema de gestión creado para cumplir con la Ley REP, ha integrado a varias empresas para coordinar la recolección y reciclaje de envases y embalajes. Inversiones como las plantas "botella a botella" de CCU y Coca-Cola han establecido nuevos estándares para el reciclaje avanzado.

Sin perjuicio de ello, la industria de alimentos y bebidas enfrenta retos no menores con la demanda y creación de empaques sostenibles; tanto los envases compostables como los reciclables deben cumplir con estrictos requisitos de inocuidad alimentaria y adecuada preservación de los alimentos, lo que exige innovación en materiales y procesos de fabricación. Aquí, la tecnología es indispensable para desarrollar envases que no sólo sean sostenibles, sino también seguros y eficientes en términos de costos y recursos.

7. ¿Cómo está el reciclaje de plástico en el país en referencia a Latinoamérica y el resto del mundo?

Chile recicla aproximadamente el 7% de sus residuos plásticos, una cifra baja frente a países europeos pero competitiva en el contexto latinoamericano. Países como Colombia tienen tasas similares, mientras que Europa supera el 30% en algunas regiones.

Como ya se mencionó, el avance normativo como la Ley REP y Ley PUSU, posiciona a Chile como líder potencial en la región, aunque aún enfrenta desafíos relacionados con la infraestructura y la educación ambiental.

8. ¿Cómo se están relacionando las universidades con el sector industrial y el reciclaje del plástico?

Considero que, pese a que no es una práctica sistemática ni masificada, las universidades han establecido alianzas estratégicas con el sector industrial para desarrollar soluciones innovadoras en reciclaje. Proyectos como TechTraPlastiCE fortalecen las capacidades de transferencia tecnológica y facilitan la colaboración entre academia, industria y gobierno.

Estas relaciones no solo generan conocimientos aplicados, sino que también ofrecen formación técnica y profesional en economía circular, ampliando las capacidades del país para enfrentar los desafíos del reciclaje y la sostenibilidad.

**TechTraPlastiCE - WP1 – FRAMEWORK
TAREAS 1 Y 2**

FICHA LEVANTAMIENTO DE INFORMACIÓN

Responsable de la entrevista

Fecha:	2025	Universidad:	Pontificia Universidad Católica de Valparaíso (PUCV)
Responsable:	Sandra Ponce		

Información de la empresa

Razón social:	Agencia de Sustentabilidad y Cambio Climático (ASCC)		
Dirección:	-		
Nombre de contacto:	Pablo Calderon	Cargo:	-
Correo electrónico:	pablo.calderon@ascc.cl	Teléfono:	-

Descripción de la empresa

Rubro:	Acuerdos de Producción Limpia
Tamaño (indicar aproximado de ventas anuales):	-
Ubicación(es), si tiene más de una sucursal a nivel nacional e internacional	Santiago de Chile
¿Qué productos plásticos maneja y para qué tipo de aplicaciones?	apoyo a empresas en sustentabilidad y economía circular

Leyes y regulaciones nacionales e internacionales relacionadas con plásticos y economía circular

- a. ¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?
- b. ¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?
- c. ¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?

¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?

Acuerdos de Producción Limpia al sector Plástico, para mejorar la cadena de valor y dar circularidad a sus productos

¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?

Conocimiento, falta de planes de gestión de residuos, un sistema de gestión a nivel nacional que de soporte a las empresas

¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?

beneficios en sustentabilidad, económicos, medio ambientales y sociales.

Factores y actores clave en la transición hacia la Economía Circular

- ¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?
- ¿Qué debilidades o barreras enfrenta su empresa en esta transición?
- ¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?
- ¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?
- ¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?
- ¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?

¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?

gestionar los residuos, volver residuos a la cadena de valor, eficiencia

¿Qué debilidades o barreras enfrenta su empresa en esta transición?

compromiso, sistemas de gestión

¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?

empresa, empresas valorizadoras, ministerio de medio ambiente, ministerio de salud, recicladores base tenemos vínculos

¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?

tenemos vínculos con universidades para desarrollar acuerdos de producción limpia relacionados con la valorización de residuos

¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?

transferencia tecnológica, sistemas de gestión

¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad?

colaboramos con el sector público-privado para generar acuerdos en vías de dar cumplimiento a la normativa y mas allá.

**TechTraPlastiCE - WP1 – FRAMEWORK
TAREAS 1 Y 2**

FICHA LEVANTAMIENTO DE INFORMACIÓN

Responsable de la entrevista

Fecha:	24/06/2025	Universidad:	Pontificia Universidad Católica de Valparaíso (PUCV)
Responsable:	Ivania Sepúlveda		

Información de la empresa

Razón social:	ASIPLA		
Dirección:	-		
Nombre de contacto:	Nicole	Cargo:	
Correo electrónico:	nicole.gorab@asipla.cl	Teléfono:	

Descripción de la empresa

Rubro:	Asociación gremial de empresas de plástico
Tamaño (indicar aproximado de ventas anuales):	250.000-350.000 USD anuales
Ubicación(es), si tiene más de una sucursal a nivel nacional e internacional	Santiago de Chile
¿Qué productos plásticos maneja y para qué tipo de aplicaciones?	No fabricamos ni comercializamos, son nuestras empresas socias las que hacen eso. Es bien variado, fabrican envases y embalajes, tuberías, geomembranas, etc abasteciendo a muchas industrias. También otro grupo relevante son los que comercializan materias primas vírgenes (sobre todo termoplásticos) y los que valorizan residuos plásticos (sobre todo PE, PP no domiciliario).

Leyes y regulaciones nacionales e internacionales relacionadas con plásticos y economía circular

- a. ¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?
- b. ¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?
- c. ¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?

a. ¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?

Tenemos un Comité o mesa técnica dedicada exclusivamente a temas regulatorios (comité de políticas públicas), desde ese comité se desarrollan estrategias, acciones y se definen posturas para abordar proyectos de ley y políticas públicas en discusión. Otro comité es el de desarrollo sostenible donde procuramos que todas nuestras empresas socias estén bien informadas respecto de si son reguladas o no, y si deben cumplir con la obligación de adherir a un Sistema de Gestión para dar cumplimiento a la REP de Envases y Embalajes, en el rol de Productor.

Hace años desde ASIPLA hemos estado súper disponibles para reunirnos con socios que tienen dudas sobre la Ley REP u otra normativa.

b. ¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?

Desde el punto de vista de nuestros socios, notamos que hay falta de conocimiento, ocurre que a veces estas leyes son muy técnicas y no todos las comprenden (en el caso de la REP o PUSU). En el caso de la Ley de Bolsas, que prohibió las bolsas camiseta en los supermercados, notamos que las empresas que fabricaban estas bolsas tuvieron que reinventarse migrando a otra materialidad o bien cerraron sus operaciones.

c. ¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?

Respondiendo por ASIPLA (quienes no tenemos que cumplir leyes si no que empujamos para que nuestros socios las cumplan): el hecho de tener el tema normativo presente atrae a que más empresas se asocien al gremio, por lo tanto, atraer a nuevos socios es un beneficio.

Factores y actores clave en la transición hacia la Economía Circular

- a. ¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?
- b. ¿Qué debilidades o barreras enfrenta su empresa en esta transición?
- c. ¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?
- d. ¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?
- e. ¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?
- f. ¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?

1. ¿Qué oportunidades existen o ha logrado identificar para fomentar la economía circular en el sector plástico?

En cuanto a beneficios está el triple impacto: medioambiental, social y económico que ofrecen acciones o medidas relativas al desarrollo sostenible y nuestros socios tienen eso super claro. Hemos visto que nuestros socios desean avanzar en capacitaciones de sus colaboradores en temas de sostenibilidad, programa eficiencia energética, medición de huella de carbono, participación en APL, entre otras.

2. ¿Qué debilidades o barreras enfrentan las empresas nacionales en esta transición?

Según una encuesta aplicada a nuestras empresas socias, la falta de tiempo y el hecho de no tener a una persona responsable son barreras/trabas que limitan esta transición.

3. ¿Qué actores son clave para impulsar la economía circular en el sector plástico?

Nosotros como ASIPLA somos un actor clave para guiar a nuestros socios en la implementación de acciones relativas a economía circular o implementación de normativas. Los gremios/asociaciones en general son un buen aliado (CENEM, Anir, Pacto de los Plásticos, etc).

4. ¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?

Hemos colaborado con universidades en este ámbito, por ejemplo, con la UNAB donde estuvimos haciendo una charla a alumnos sobre economía circular y Ley REP, además con ellos firmamos un convenio de colaboración.

5. ¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?

Según lo que hemos conversado con nuestras empresas socias, innovaciones destacadas son la incorporación de resinas plásticas recicladas y contar con certificaciones.

6. ¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?

Hemos visto que nuestros socios, muchos de ellos regulados por la REP, lo que han hecho es por supuesto adherir a un Sistema de Gestión donde eventualmente cuentan con el apoyo técnico para dar cumplimiento a la normativa; posiblemente los fabricantes de envases y embalajes han tenido que modificar algún aspecto de la fabricación (por ejemplo cambiar el tipo de plástico) y/o tener un área o un encargado en la empresa para liderar estos temas.

**TechTraPlastiCE - WP1 – FRAMEWORK
TAREAS 1 Y 2**

FICHA LEVANTAMIENTO DE INFORMACIÓN

Responsable de la entrevista

Fecha:	04/12/2024	Universidad:	Pontificia Universidad Católica de Valparaíso (PUCV)
Responsable:	Sandra Ponce		

Información de la empresa

Razón social:	Ecopolímeros		
Dirección:			
Nombre de contacto:	Alejandro Cubillos	Cargo:	-
Correo electrónico:	alejandrocubillosreyes@gmail.com	Teléfono:	-

Factores y actores clave en la transición hacia la Economía Circular

- ¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?
- ¿Qué debilidades o barreras enfrenta su empresa en esta transición?
- ¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?
- ¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?
- ¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?
- ¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?

1. ¿Qué oportunidades existen o ha logrado identificar para fomentar la economía circular en el sector plástico?

Creciente interés ciudadano:

La población muestra un compromiso creciente con el uso responsable de envases y materiales reciclados. Esto genera una demanda sostenida de productos sostenibles e incentiva a más empresas a ofrecer alternativas circulares. Este interés trasciende sectores específicos, como el plástico, y se manifiesta en prácticamente todas las industrias chilenas.

Políticas y estrategias nacionales:

- **Hoja de Ruta para un Chile Circular al 2040:** Iniciativa del Ministerio del Medio Ambiente que establece metas específicas para transformar el modelo económico hacia uno circular, promoviendo sostenibilidad, justicia y participación para 2040.
- **Ley REP (Responsabilidad Extendida del Productor):** Promueve la reutilización y reciclaje, obligando a los productores a gestionar los residuos de sus productos al final de su vida útil.

Etapas inicial del reciclaje en Chile:

Aunque el reciclaje está en fases iniciales, existe un potencial considerable para incrementar la recolección y valorización de residuos. Esto se traduce en una oportunidad para diversificar modelos de negocio e implementar innovaciones.

Proliferación de startups y emprendimientos:

En Chile han emergido empresas innovadoras que desarrollan tecnologías avanzadas para transformar materiales reciclados en productos de alto valor, como la reutilización de plásticos en pinturas, compuestos plásticos o mobiliario urbano.

2. ¿Qué debilidades o barreras enfrentan las empresas nacionales en esta transición?

Desafíos en la gestión empresarial:

Implementar una economía circular implica nuevos hábitos y metodologías en gestión ambiental, lo cual conlleva un aumento en la carga laboral, recursos temporales y humanos que muchas empresas perciben como un costo sin beneficio económico inmediato.

Prioridades en tiempos de crisis económica:

Durante periodos de recesión, muchas empresas reducen su enfoque en sostenibilidad, limitándose al cumplimiento ambiental básico y priorizando la productividad a corto plazo.

Riesgos asociados al reciclaje de plásticos:

Procesos como la trituración pueden generar microplásticos si no están bien diseñados y controlados. Es crucial estructurar procesos sólidos que minimicen estas externalidades negativas.

Falta de infraestructura de acopio:

La ausencia de espacios adecuados dentro de las empresas para el almacenamiento y separación de residuos industriales limita su valorización eficiente.

Aunque el cliente o usuario final valora los atributos ambientales de los productos y materiales reciclados, la percepción pública tiende a asociar estos productos con precios más bajos debido a la idea errónea de que, al provenir de materiales reciclados, deberían ser más económicos. Sin embargo, los productos resultantes de procesos de valorización suelen requerir operaciones más específicas y técnicas avanzadas, lo que incrementa su costo de producción en comparación con los formatos tradicionales.

3. ¿Qué actores son clave para impulsar la economía circular en el sector plástico?**Actores clave en el impulso de la economía circular****Actores principales:**

- **Empresas con búsqueda de economía circular:** Empresas de diversos sectores industriales en Chile que están adoptando principios de economía circular para mejorar su eficiencia energética, reducir impactos ambientales y optimizar el uso de recursos naturales en su producción.
- **Empresas de valorización:** Transforman residuos en nuevos productos aplicando conocimientos avanzados en ingeniería, ciencia de materiales e innovación, otorgando una segunda vida útil a los materiales desechados.
- **Empresas de ingeniería y tecnología:** Proveen equipos y soluciones adaptados a las necesidades específicas de los procesos de valorización de residuos.
- **Universidades y centros de investigación:** Ofrecen innovación aplicada, servicios especializados, formación de profesionales y acceso a laboratorios avanzados.
- **Empresas de transporte:** Garantizan una logística eficiente para el traslado seguro de residuos desde su punto de generación hasta los centros de procesamiento y valorización.

Actores necesarios en mayor cantidad:

- **Proveedores de insumos químicos especializados:** Es crucial aumentar la disponibilidad de insumos químicos para procesos de valorización, que

cumplan con requerimientos técnicos para proyectos de pequeña y mediana escala.

- **Certificadoras y organismos de validación:** Aseguran el cumplimiento de normativas industriales y facilitan la integración comercial de productos valorizados.
- **Empresas de capital y financiamiento:** Ofrecen capital de riesgo y apoyo financiero estratégico para impulsar el crecimiento de startups y proyectos innovadores.

4. ¿Cómo interactúan los actores entre sí y con los factores que influyen en la economía circular?

Empresas con búsqueda de economía circular:

- **Con las empresas de valorización:**
Estas empresas entregan sus residuos industriales para que sean transformados en nuevos productos. Además, pueden incorporar materiales valorizados en sus procesos productivos, fomentando la circularidad de sus cadenas de suministro.
- **Con universidades y centros de investigación:**
Colaboran para desarrollar tecnologías que mejoren la eficiencia energética y optimicen el uso de recursos en sus procesos. También participan en estudios para identificar oportunidades de reducción de desechos y estrategias de diseño sostenible.
- **Con empresas de ingeniería y tecnología:**
Contratan soluciones personalizadas para implementar procesos sostenibles, como maquinaria eficiente, sistemas de reciclaje interno y tecnologías de energía limpia.
- **Con empresas de transporte:** Garantizan la correcta gestión logística de residuos y materias primas recicladas, facilitando su traslado hacia los centros de valorización o reutilización.

Empresas de valorización:

- **Con empresas con búsqueda de economía circular:**
Proveen materiales reciclados o valorizados, como plásticos reutilizados, compuestos innovadores o materiales reciclados específicos para procesos industriales.
- **Con universidades y centros de investigación:**
Trabajan en conjunto para desarrollar nuevos productos valorizados, optimizar procesos de reciclaje y explorar aplicaciones innovadoras para los residuos transformados.
- **Con empresas de ingeniería y tecnología:**
Adquieren equipos avanzados para mejorar la calidad y eficiencia de los

procesos de valorización. Esto incluye tecnologías de separación, triturado, limpieza y refinamiento

- **Con empresas de transporte:** Las empresas de valorización necesitan servicios logísticos eficientes para recolectar residuos desde diversas fuentes y distribuir los materiales valorizados a sus compradores finales.

Empresas de valorización y universidades/centros de investigación

Investigación y desarrollo (I+D):

Las universidades aportan conocimientos científicos y tecnológicos que impulsan la innovación en los procesos de las empresas de valorización. Este apoyo incluye el desarrollo de metodologías, validación de nuevas tecnologías y la optimización de procesos productivos.

Gestión de proyectos y financiamiento:

Estas instituciones actúan como aliados estratégicos en la postulación a fondos públicos y privados, facilitando el acceso a financiamiento. También brindan soporte en el seguimiento técnico y financiero de los proyectos, asegurando su correcta ejecución y cumplimiento de objetivos.

Infraestructura y personal especializado:

Universidades y centros de investigación ofrecen acceso a laboratorios, equipos de alta tecnología y espacios diseñados para experimentación. Además, ponen a disposición personal altamente calificado, proporcionando servicios de innovación que fortalecen las capacidades técnicas de las empresas de valorización y mejoran los resultados de sus iniciativas

5. ¿Qué políticas o estrategias podrían fortalecer estas relaciones?

1. Beneficios tributarios para empresas que promuevan la economía circular:

Implementar incentivos fiscales específicos para las empresas y ecosistemas que trabajen en la implementación de modelos de economía circular. Esto podría incluir reducciones tributarias, deducciones fiscales o créditos por el uso de productos valorizados y la adopción de prácticas sostenibles en sus procesos.

2. Obligatoriedad de tasas de reciclaje y uso de materiales valorizados:

Establecer requerimientos obligatorios de incorporación de materiales reciclados o valorizados en proyectos de construcción que ingresen al Sistema de Evaluación de Impacto Ambiental (SEIA). Esta medida podría ser una forma directa de compensar el impacto ambiental generado y promover una mayor demanda de estos materiales en el sector construcción.

3. Sello avanzado de economía circular:

Crear un certificado que cumpla dos objetivos fundamentales:

- **Transparencia y sensibilización:** Comunicar de manera clara y accesible el esfuerzo ambiental que las empresas están logrando. Esto podría influir positivamente en las decisiones de compra de consumidores y en las relaciones comerciales entre empresas.
- **Estándares cuantificables:** Establecer reglas claras para medir el impacto ambiental, como la reducción efectiva de emisiones de CO₂ y el ahorro de agua en los procesos productivos. Este sello podría ser una referencia tanto para consumidores como para reguladores.

4. Desarrollo de un marketplace para la economía circular:

Crear una plataforma digital que reúna a actores clave de la economía circular, incluyendo empresas, universidades y fondos de inversión. Este marketplace serviría para:

- **Conexión entre desafíos y soluciones:** Empresas podrían publicar sus necesidades específicas relacionadas con la economía circular, mientras que otras empresas o universidades ofrecen soluciones innovadoras.
- **Evaluación de impacto:** Permitir a las empresas emergentes o iniciativas identificar cuáles de sus soluciones tienen un alto potencial de impacto, tanto a nivel nacional como internacional.

**TechTraPlastiCE - WP1 – FRAMEWORK
TAREAS 1 Y 2**

FICHA LEVANTAMIENTO DE INFORMACIÓN

Responsable de la entrevista

Fecha:	26/06/2025	Universidad:	Pontificia Universidad Católica de Valparaíso (PUCV)
Responsable:	Sandra Ponce		

Información de la empresa

Razón social:	Natural Plas		
Dirección:			
Nombre de contacto:	Raul Rojas	Cargo:	Gerente de Economía Circular
Correo electrónico:	raul.rojas@naturalplas.cl	Teléfono:	

Descripción de la empresa

Rubro:	Economía Circular Industrial en Plástico, Textil y Calzado
Tamaño (indicar aproximado de ventas anuales):	1
Ubicación(es), si tiene más de una sucursal a nivel nacional e internacional	El Otoño 11. Comuna de Lampa. Región Metropolitana. Chile
¿Qué productos plásticos maneja y para qué tipo de aplicaciones?	HDPE y PP. Fabricación de Pellets materia prima para el mercado y, fabricación de piezas de inyección para la industria, retorno de residuos a la operación (minería y eléctricas) con Valor Circular.

Leyes y regulaciones nacionales e internacionales relacionadas con plásticos y economía circular

- a. ¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?
- b. ¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?
- c. ¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?

¿Qué acciones ha tomado la empresa para el cumplimiento de la legislación aplicable al sector plástico/economía circular?

La creación de nuestra empresa, en sí misma, fue una acción en apoyo, para dar cumplimiento de las leyes vigentes por parte de las empresas clientes. Con estándares industriales y certificaciones de mercado.

¿Cuáles son las barreras o desafíos que tienen las empresas para cumplir la legislación local?

La cultura. Desde la cultura aún pero cada vez menos, enraizada la cultura del reciclaje de Logística de Residuo, retiro de residuo por parte de un proveedor y, lo que le pase al residuo ya no es responsabilidad de la empresa cliente, por que ya obtuvo el certificado de disposición final, cumplió para la ley. Esto ha ido cambiando poco a poco, pero muchas iniciativas para las empresas quedan paralizadas, por factores financieros.

¿Cuáles son los beneficios que obtiene o podría obtener la empresa por cumplir con la legislación local?

Nosotros damos el beneficio a las empresas. Emisión de Certificación de cumplimiento legal y ambiental, emitido por una empresa validada en el sistema. Impacto directo en los indicadores de Sostenibilidad Corporativa (Economía Circular, Huella de Carbono, otros que generamos para reportabilidad y trazabilidad).

Factores y actores clave en la transición hacia la Economía Circular

- ¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?
- ¿Qué debilidades o barreras enfrenta su empresa en esta transición?
- ¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?
- ¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?
- ¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?
- ¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?

¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?

Nosotros generamos y operacionalizamos la práctica de la Economía Circular para el mercado chileno. Somos una planta de Economía Circular.

¿Qué debilidades o barreras enfrenta su empresa en esta transición?

Barrera, contratos de empresas de largo plazo con Proveedores de Logística de Retiro de Residuos. Nuestra participación comienza en etapas.

¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?

Empresas clientes industriales, empresas de logística de residuos, gobierno de Chile,

¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?

Muy bien, tenemos una alianza de 4 años, con UDT de la Universidad de Concepción.

¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?

Hoy nos abrimos y participando exitosamente en el mercado, con las innovaciones circulares (nuevas líneas de negocios y soluciones) en Textil y Calzado Industrial. Nuestros clientes son las principales cadenas del Retail, minería, eléctricas y servicios.

¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad?

Creando e innovando nuevos servicios para el mercado industrial.

**TechTraPlastiCE - WP1 – FRAMEWORK
TAREAS 1 Y 2**

FICHA LEVANTAMIENTO DE INFORMACIÓN

Responsable de la entrevista

Fecha:		Universidad:	Pontificia Universidad Católica de Valparaíso (PUCV)
Responsable:	Sandra Ponce		

Información de la empresa

Razón social:	Revaloriza S.A		
Dirección:	Lote 865 sector industrial Iajarilla, 2520000 Valparaíso, Viña del Mar		
Nombre de contacto:	Nicolás Rivas	Cargo:	Gerente General
Correo electrónico:	nrivas@revaloriza.cl	Teléfono:	9 4900 9797

Descripción de la empresa

Rubro:	Revaloriza está conformada por 5 empresas del rubro construcción, inmobiliario y medioambiente, que poseen como propósito común el desarrollo respaldado por la responsabilidad socio ambiental.
Tamaño (indicar aproximado de ventas anuales):	-
Ubicación(es), si tiene más de una sucursal a nivel nacional e internacional	Sucursal Nacional. Dirección Lote 865 sector industrial Iajarilla, 2520000 Valparaíso, Viña del Mar
¿Qué productos plásticos maneja y para qué tipo de aplicaciones?	Revaloriza SA se enfoca en la revalorización de plásticos, principalmente a través de la recolección y procesamiento de residuos plásticos post-consumo. Manipulan una variedad de plásticos, incluyendo envases, embalajes, y otros tipos de plásticos. La revalorización de estos plásticos se aplica en diversas áreas, como la fabricación de nuevos productos, la obtención de materias primas para la industria, y la reducción de la huella de carbono de las empresas.

Factores y actores clave en la transición hacia la Economía Circular

- ¿Qué oportunidades identifica su empresa para adoptar prácticas de economía circular?
- ¿Qué debilidades o barreras enfrenta su empresa en esta transición?
- ¿Qué actores son clave para su empresa en la transición hacia la economía circular o para el cumplimiento de la legislación?
- ¿Cómo se relaciona su empresa con las universidades en la adopción de prácticas de economía circular?
- ¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?
- ¿Cómo se está adaptando su empresa para el cumplimiento de la normatividad (ejemplos: plástico de un solo uso, Responsabilidad Extendida del Productor (REP), entre otras)?

1. ¿Qué oportunidades existen o ha logrado identificar para fomentar la economía circular en el sector plástico?

Existen múltiples oportunidades, ya que hay muchos frentes por cubrir:

- Desde el punto de vista de la infraestructura existe una oportunidad evidente en la mejora de los sistemas de clasificación, con el objetivo de aumentar la calidad del plástico recuperado. A su vez, poder implementar estrategias para captar más residuos de post-consumo y post-industriales.
- Es posible a su vez, diseñar sistemas de retorno de envases y productos involucrando a los consumidores (logística inversa) y aumentar el uso de envases retornables.
- Respecto al desarrollo de nuevos productos de alto valor, la creación de innovación y colaboraciones público-privadas

2. ¿Qué debilidades o barreras enfrentan las empresas nacionales en esta transición?

En este punto, es necesario que se consideren distintas dimensiones, ya que lamentablemente existen muchas brechas que debemos superar:

- Falta de incentivos económicos: Los costos de inversión para nuevas tecnologías son elevados, por lo cual desincentiva el emprendimiento. Además, si bien existen programas gubernamentales, requieren de procesos largos e inversión en horas hombre para sus postulaciones. Por último, el financiamiento por banca tradicional es escaso y los créditos verdes generalmente son con tasas altísimas que tienen un peso relevante en el flujo de caja de las empresas.
- Infraestructura: Debido al punto anterior, no existe una cantidad suficiente de plantas con la capacidad tecnológica para tratar todos los tipos de plásticos; además, en la recolección aún no se ha llegado al punto de la segregación en origen, lo que dificulta los procesos posteriores.
- Competencia: Si bien existen innovaciones respecto a la producción con materias primas recicladas, los precios usualmente no son competitivos con el mercado actual, lo que genera una baja demanda de los mismos.

- Logística: Debido a la geografía en Chile, la recolección y distribución de residuos tiene altos costos, lo que limita el tratamiento de volúmenes grandes para generar economías de escala.

3. ¿Qué actores son clave para impulsar la economía circular en el sector plástico?

La transición a la economía circular es un esfuerzo colectivo que requiere la alineación de objetivos y acciones entre estos actores. Por mencionar algunos está el Estado, Empresas privadas, Consumidores, Academia, Inversionistas y entidades financieras, Organismos internacionales, medio de comunicación, etc

4. ¿Cómo interactúan los actores entre sí y con los factores que influyen en la economía circular?

Las interacciones son múltiples, por lo que prefiero mencionar algunas funciones que debería cumplir cada uno de los actores:

- Estado: Políticas públicas, fiscalización e inversión en infraestructura.
- Empresa privada: Establecer alianzas con empresas recicladoras para asegurar la utilización de material reciclado, colaborar con el desarrollo de políticas públicas en conjunto con el Estado.
- Consumidores: Demandar productos que contengan material reciclado en sus proceso.
- Academia: Desarrollar soluciones tecnológicas económicamente viables
- Inversionistas y entidades financieras: Proveer de financiamiento flexible y con tasas alcanzables a largo plazo
- Organismos Internacionales: Financiamiento para la asistencia a ferias de alto nivel internacional con el fin de importar nuevas tecnologías. Difusión de actividades de índole tecnológico
- Medios de comunicación: Difusión de mensajes educativos y dar visibilidad a empresas y proyectos sostenibles en horarios de audiencia masivas.

5. ¿Qué políticas o estrategias podrían fortalecer estas relaciones?

- Agilización de permisología: Es INDISPENSABLE que se agilice la obtención de permisos, patentes municipales y procesos administrativos para destrabar la creación de nuevas empresas y soluciones innovadoras.
- Incentivos económicos: subsidios y beneficios fiscales para empresas que utilicen material reciclado o inviertan en tecnología e infraestructura para estos fines.
- Desarrollo de infraestructura: Generar alianzas público-privadas para construir instalaciones que cubran territorios regionales, con sistemas de recolección avanzados.

A.8 Answers from Colombia

H QUESTIONNAIRE AND INTERVIEW RESPONSES: COLOMBIA

Nombre de la empresa / entidad/ asociación	¿Qué acciones ha tomado la empresa/entidad/asociación para el cumplimiento de la legislación aplicable al sector plástico/economía circular?	¿Cuáles son las barreras o desafíos que tiene la empresa/entidad/asociación para cumplir la legislación local?	¿Cuáles son los beneficios que obtiene la empresa/entidad/asociación por cumplir con la legislación local?	¿Qué oportunidades identifica su empresa/entidad/asociación para adoptar prácticas de economía circular?	¿Qué debilidades o barreras enfrenta su empresa/entidad/asociación en esta transición?	¿Qué actores son clave para su empresa/entidad/asociación en la transición hacia la economía circular o para el cumplimiento de la legislación?	¿Cómo se relaciona su empresa/entidad/asociación con las universidades en la adopción de prácticas de economía circular?	¿Qué innovaciones ha desarrollado para adoptar prácticas de economía circular con beneficios para el ambiente y el desarrollo sostenible?	¿Cómo se está adaptando su empresa/entidad/asociación para el cumplimiento de la normatividad?
OCADE SAS	Identificamos el plástico con componentes contaminantes orgánicos persistentes como plásticos bromados, se separan de los plásticos que se van a reciclar. Estos plásticos con contaminantes orgánicos persistentes se eliminan en hornos incineradores aprobados por la autoridad ambiental para eliminación de estos cop. La corriente de plástico libre de cop se lleva a empresas que hacen reciclaje	Falta de recursos	Considero necesario e importante que se haga reconocimiento y divulgación de la práctica ambiental que desarrollamos y que nos apoyen con recursos económicos para el fortalecimiento de nuestras capacidades de gestión para fortalecer la cadena de las empresas que realizan la transformación del plástico	Reconocimiento y divulgación y que nos facilite el tener acceso a mayor mercado	Falta de recursos	Empresas con mayor responsabilidad ambiental que nos entreguen sus rae	Trabajamos con el ministerio del ambiente, naciones unidas y la giz	Reacondicionamiento de equipos de cómputo y separación e identificación de plásticos rae con cop	cumplimiento de la Responsabilidad Extendida del Productor (REP)
World Compost SAS	Participación en eventos pertinentes	Legislación y Reglamentación no muy claras ni precisas	Además de ser una respuesta ÚNICA respecto al medio ambiente no tenemos incentivos precisos y consistentes	El mercado lo hace tan necesario como exigente	Información legal clara y reglamentación precisa	Fabricantes y Clientes deben hablar y entender de la misma manera lo vital de la Economía Circular	Trabajamos en consuno	Estamos diseñando, al amparo de la Ley, un plan más concreto y entendible para que se pueda disipar el miedo y la desinformación	Internamente tenemos diseños pertinentes bajo ese esquema
Grupo Plásticos De Colombia SAS	Estamos registrados como empresa transformadora de residuos de envases y empaques	Apoyo financiero y tecnológico	NINGUNO	Ampliar capacidad	Apoyo financiero e información y actualización	Proveedores (recicladores y transformadores) Gobierno	NO	Darle usos a materiales recolectados de la basura	Con la poca información ha sido complejo

