Mapping the Post-Consumer Aluminium Scrap Value Chain in Colombia

Stakeholders, Flows, and Commercial Dynamics

December 2025

Title:
Mapping the Post-Consumer Aluminium Scrap Value Chain in Colombia: Stakeholders, Flows, and Commercial Dynamics

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CARE Project – Collective Action for Recycling and Empowerment

Project Partners:

- Aluminium Stewardship Initiative (ASI)
- Compromiso Empresarial para el Reciclaje (CEMPRE Colombia)
- International Aluminium Institute (IAI)
- Canpack Colombia
- Crown Holdings
- One Planet Ltd (Roundtable on Responsible Recycling of Metals - RRRM)
- Recycled Materials Association (ReMA)
- Associação Brasileira do Alumínio (ABAL)

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1. EXECUTIVE SUMMARY

As part of the CARE project, led by the Aluminium Stewardship Initiative (ASI) and CEMPRE Colombia in 2025, a comprehensive diagnostic study was conducted on the post-consumer aluminium scrap value chain in Colombia, with a particular focus on the participation of informal waste pickers. The study examined various stages of the chain — including collection, aggregation, commercialisation, export, transformation, and manufacturing — in two strategic regions: Bogotá and Barranquilla. The objective was to identify current conditions, bottlenecks, structural challenges, and opportunities to progress towards a more efficient, traceable, and inclusive circular economy model.

Colombia has a strong legal framework that recognises waste pickers as key actors in the public sanitation service. However, the management of post-consumer aluminium scrap continues to operate under conditions of informality, operational fragmentation, and weak cross-sector coordination. The dominant model is geared towards export, given the country's limited capacity to reprocess aluminium scrap into new packaging materials. This results in an active value chain, but one that lacks national industrial consolidation.

Waste pickers primarily collect aluminium scrap from both residential and commercial sources — the latter being especially relevant in sectors such as food, beverages, and entertainment. The commercialisation of scrap is shaped by price dynamics that favour external intermediaries and exporters over local Sorting and Recovery Stations (ECAs in Spanish), which face higher operational costs. Most sales occur weekly or fortnightly, with volume and price varying depending on the type of buyer. While scrap is delivered both loose and compacted, presentation has limited influence on pricing, except where it reduces logistics costs.

In terms of traceability, 88% of surveyed organisations issue invoices for at least 80% of the aluminium scrap they sell — a notable advancement in formalisation. Nevertheless, regulatory and operational barriers still limit full reporting to the public services system. These include inconsistent records, the exclusion of commercial sources from official recognition, and technical issues that delay timely service payments. As a result, a substantial portion of material goes unreported, which impedes its recognition under Extended Producer Responsibility (EPR) schemes.

From a commercial standpoint, exporters account for a significant share of the available aluminium scrap, leveraging their ability to operate on tight margins and with more competitive logistics. However, they also face challenges such as exchange rate volatility, high land transport costs, and strict quality demands from international buyers. While exporters show willingness to collaborate with organised waste picker groups, divergent expectations around material presentation, minimum volumes, and payment terms lead to inconsistent and sometimes unstable trading relationships.

Local aluminium packaging manufacturers indicated that nearly all the aluminium used in their production processes is imported — primarily due to structural constraints such high costs of installing processing facilities, and the absence of a consolidated national network of aluminium scrap suppliers. While they recognise the value of recycled material and express interest in integrating it, the limited traceability and informality within the domestic value chain are seen as critical barriers.

Producers — particularly in the beverage sector — highlighted the urgent need for traceability mechanisms that verify the flow of aluminium scrap from collection through to transformation, even if the material is exported. Under Colombia's current EPR regulations, only domestically transformed material qualifies as compliant, effectively excluding much of the aluminium scrap that is collected and managed. This underscores the importance of coordinating actors across the entire chain to document the full lifecycle of the material and ensure traceability — recognising the contributions of waste pickers, traders, and exporters alike.

To strengthen the management of aluminium scrap, organisations identified several priority incentives: access to equipment (e.g., compactors), logistical support for transport, tax relief on material sales, and mechanisms to mitigate price volatility. On the occupational health and safety front, incidents involving cuts, poor posture, and falls during scrap collection and handling were reported. However, accidents specifically related to aluminium scrap were minimal, suggesting its management presents no greater risk than that of other recoverable materials.

In conclusion, the post-consumer aluminium scrap value chain in Colombia is active but lacks the structural integration required for it to function as a fully circular system. While key stakeholders exist at each stage, their interaction occurs under unequal conditions and without shared technical standards or long-term agreements. Traceability remains limited, and domestic transformation of aluminium scrap is virtually non-existent. Nonetheless, there are clear opportunities to strengthen the chain through targeted public policy, sector investment, and coordinated collaboration among all actors.

1.1. Highlights

- Aluminium scrap value chain is active but fragmented, with weak coordination across actors.
- Waste pickers play a central role in collection, with 88% issuing invoices for ≥80% of sales.
- Most scrap is exported; domestic processing remains minimal due to structural constraints.
- Market shaped by price volatility, low margins, and logistical barriers.
- Key incentives: access to equipment, transport support, and working capital.
- Common H&S risks include cuts, poor posture, and same-level falls.
- Limited traceability restricts EPR compliance despite growing brand interest in circular models.
- Strengthening traceability, supporting waste picker formalisation, and building inclusive alliances with exporters and brands are key to unlocking a circular model.

2. CONTEXT OF POST-CONSUMER MATERIAL RECOVERY IN COLOMBIA

In Colombia, the recovery of packaging waste is supported by a robust legal framework that recognises informal waste pickers as complementary providers of the public sanitation service. This recognition is established through several key legislative instruments: Law 142 of 1994 (Article 14), which defines recovery as a complementary activity of the sanitation service; Decree 596 of 2016 (incorporated into Unified Decree 1077 of 2015), which outlines the transitional framework for the formalisation of waste picker organisations; and Decree 1381 of 2024, which updates key definitions — including "informal waste picker" — and adjusts the criteria for their inclusion in recovery schemes. Furthermore, Colombia's Constitutional Court has issued multiple rulings and orders (including T-291 of 2009, Auto 275 of 2011, T-724 of 2003, and Auto 268 of 2010, among others), recognising waste pickers as a social group entitled to special constitutional protection and mandating affirmative actions to ensure their effective inclusion in the country's recycling and sanitation systems.

Despite this solid legal backing, major challenges persist. These include a lack of adequate infrastructure for Sorting and Recovery Stations (ECAs), uneven regional coverage of selective collection routes, the continued presence of informal practices and inequitable intermediaries, and the limited involvement of waste pickers in Extended Producer Responsibility (EPR) schemes. Nonetheless, there are also important opportunities to be leveraged: strengthening the collective organisation of waste pickers, improving their access to financial tools and state incentives, fully integrating them into post-consumer systems, and promoting citizen education to encourage source separation. Together, these strategies could help close existing gaps, dignify the role of waste pickers, and enhance the recovery of packaging waste in the country.

Compromiso Empresarial para la Economía Circular (CEMPRE Colombia) is a non-profit organisation founded in 2009, dedicated to advancing the circular economy and generating shared prosperity across all actors in the material value chain. It currently acts as the spokesperson and administrator of a collective plan for the management of post-consumer packaging waste. One of its core lines of action is the strengthening of key segments of the value chain — including informal waste pickers.

Within the framework of the CARE project, developed in 2025 by ASI and CEMPRE Colombia, a diagnostic study was carried out to identify the main characteristics of post-consumer aluminium scrap management. The assessment focused on two specific regions: Barranquilla and Bogotá, where the local initiatives *Movimiento Re* and *Reciclar tiene Valor Bogotá* are currently working to strengthen waste picker organisations. The findings of the study are summarised in the following sections.

Illustration 1. ASI and CEMPRE visit to Movimiento Re Organisations, 2025

3. APPROACH TO THE MAPPING EXERCISE

Similar to the *Engage* phase of the Harmonized Responsible Sourcing Framework Implementation Phases — particularly the *Stakeholder and Value Chain Mapping* activity — the CARE project's mapping exercise aimed to build a shared understanding of the aluminium recycling value chain in Colombia, identify key actors and linkages, and inform future responsible sourcing and due diligence efforts. This work provided a foundation for more inclusive and traceable recycling systems by highlighting where material and information flows are well established and where visibility gaps remain.

The approach combined **semi-structured interviews**, **participatory workshops**, and **field observations** to collect both qualitative and quantitative data on organisational practices, roles, income streams, and challenges. In total, **over 100 interviews** were conducted across the value chain, with a focus on informal and under-represented groups such as waste pickers. This included:

- **15 waste picker cooperatives**, representing diverse geographic and organisational contexts;
- **80+ individual waste pickers**, whose insights were particularly valuable for the accompanying *Living Income Study*;
- **Intermediaries (1)** and **exporters (3)**;
- **Processors (2)** and **can manufacturers (2)**;
- **Public authorities (2)** and **a beverage brand (1)**.

The mapping helped to visualise material and information flows, uncover **visibility and traceability gaps**, and identify critical leverage points for improving environmental and social outcomes. Insights from this phase are also intended to guide the next steps of the Harmonized Framework: Assess, Remediate, Build Capacity, and Monitor, Evaluate, and Report.

4. DIAGNOSTIC: WASTE PICKER ORGANISATIONS

With the aim of gaining a more detailed understanding of aluminium scrap management — particularly scrap derived from packaging materials — a diagnostic study was conducted using a semi-structured survey applied to various actors across the value chain. The majority of respondents were informal waste picker organisations, who represent the first link in Colombia's recyclable materials value chain. The key findings are outlined below:

4.1. Source and Peak Periods of Material Availability

Approximately 74% of the aluminium scrap collected originates from residential sources, while the remaining 26% comes from commercial sources. This confirms that, although household-level source separation significantly contributes to material recovery, the commercial sector — particularly hotels, restaurants, and bars — also generates substantial volumes of aluminium scrap, mainly linked to the consumption of soft drinks, energy drinks, and alcoholic beverages. A significant share—approximately 71%—of recovered aluminium in Colombia originates from Used Beverage Cans (UBCs), which are among the most valuable and consistently collected post-consumer materials due to their high recyclability and well-established recovery networks. The remaining 29% consists of other aluminium products such as window frames, cookware, vehicle and electronic components, which tend to be more dispersed, less standardised, and often harder to collect systematically.

Regarding peak collection periods, these coincide with the end-of-year holiday season and Carnival festivities — particularly in Barranquilla — spanning the months from November to February. In contrast, April and August are reported by waste picker organisations as periods of low aluminium scrap availability. This decline may be related to the absence of major festivities during these months, which likely leads to a drop in beverage consumption among the general population.

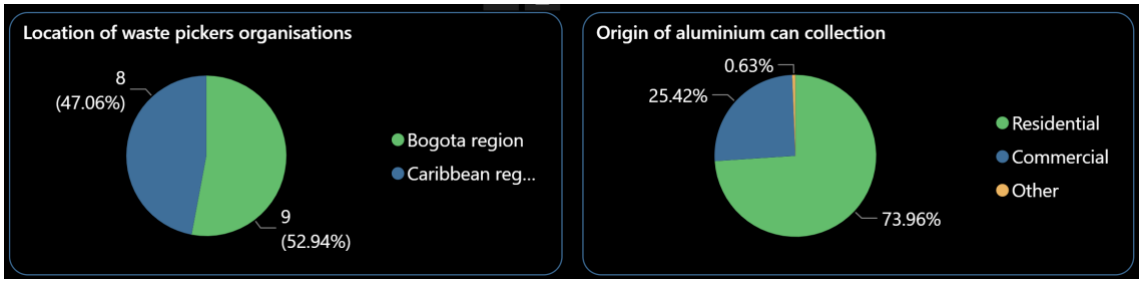

Figure 1. Location of Waste Picker Organisations and Material Origin

4.2. Commercialisation

In this area, 47% of waste pickers reported selling aluminium scrap directly to the Sorting and Recovery Stations (ECAs) to which they are affiliated. However, 23% indicated that they sell exclusively to external actors, such as scrap dealers or commercial intermediaries, while the remaining 30% carry out mixed sales involving both types of buyers. This distribution is primarily driven by price dynamics: selling to scrap dealers tends to be more favourable for waste pickers, as these buyers do not undertake additional processes such as material preparation or site

maintenance, unlike ECAs. As a result, waste picker organisations — which assume these operational costs — may offer lower prices for the material.

Illustration 2. Sorting and Recovery Stations (ECAs)

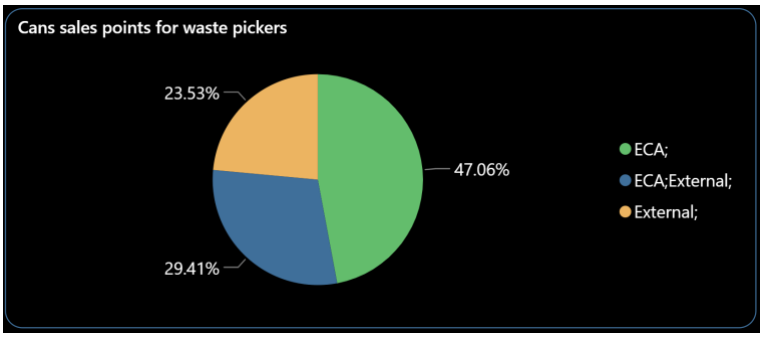

Figure 2. Can sale points for waste pickers

Regarding the destination of the aluminium scrap purchased by ECAs, 52% is sold directly to exporters, 35% to new intermediaries or scrap dealers, and only 12% to aluminium scrap processors — both formal and informal. These figures reflect the dominance of the export-oriented model in the regions studied, a consequence of Colombia's limited industrial capacity to reprocess aluminium scrap into new packaging materials. Some organisations choose to sell to commercial intermediaries for reasons related to maintaining cash flow for day-to-day operations, as well as the ability to sell the material more quickly and in smaller volumes.

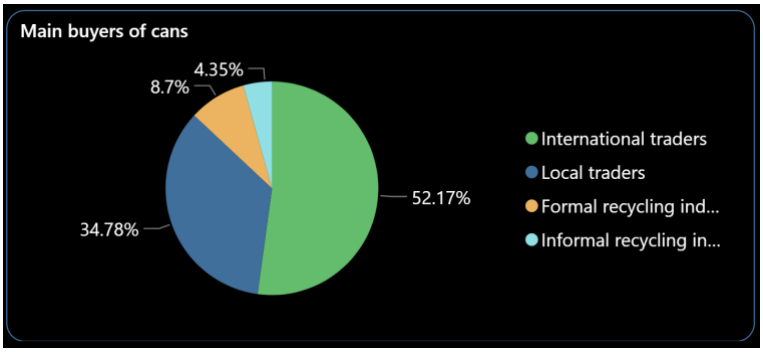

Figure 3. Main buyers of aluminium scrap

Sales to formal aluminium processors were only identified in the Bogotá region, and their presence in the market remains minimal — representing just 8% of purchases. These transactions are sporadic and subject to variable pricing, which limits the role of formal processors as significant actors in the commercial chain for post-consumer aluminium scrap.

4.3. Material Preparation and Aluminium Scrap Price Dynamics

Aluminium scrap is delivered in loose form in 53% of cases, while the remaining 47% is delivered compacted. It was noted that the presentation of the material does not have a direct or significant impact on the sale price. However, compacting is more common in the Bogotá region, where it is used as a strategy to optimise both freight costs and transport space. This practice aims to facilitate the shipment of the material to ports on the Caribbean or Pacific coasts for export.

Illustration 3. Material classification by waste pickers / Sorted material by ECAs

Minimum volumes required for commercial transactions vary by region and according to the type of buyer. When the buyer is an exporter, sales on the Atlantic coast typically take place in batches of around 600 kg, whereas in Bogotá and the Sabana Centro region, this figure drops to 122 kg. This difference is explained by the presence of exporter-operated facilities in Sabana Centro, which allow them to carry out aggregation and preparation activities, making them more flexible in accepting smaller volumes from multiple sources until the full export load is assembled.

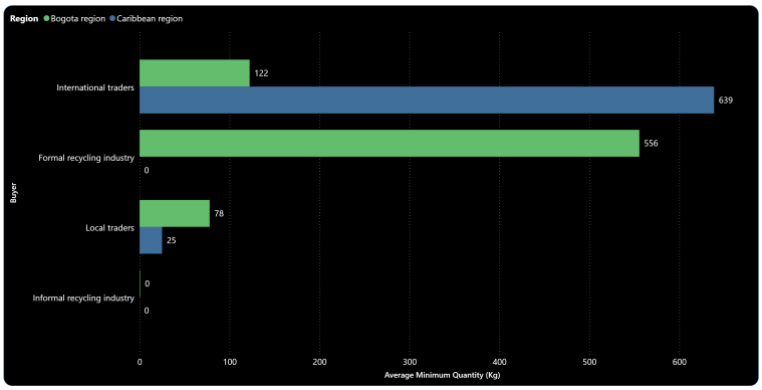

Figure 4. Minimum Commercialisation Volumes

In contrast, when the buyer is a commercial intermediary or scrap dealer, they are willing to accept smaller quantities — ranging from 25 kg to 78 kg — since their role is precisely to collect and consolidate material until they have enough to resell it, either to exporters or other intermediaries.

Finally, when the buyer is a processor, the minimum required volumes are generally around 500 kg. This is due to the fact that these materials are destined for industrial processes and, typically, the processing facilities are located outside urban centres. Therefore, larger volumes are necessary to make transport costs economically viable.

4.4. Logistics and Operations

In logistical and operational terms, 41% of the organisations reported not using any machinery to prepare aluminium scrap for sale. Meanwhile, 32% stated that they use compactors to optimise shipments, 18% use forklifts for loading the material, and just 9% indicated that the only tools they require for preparation are large bags or tarpaulins (commonly referred to as "globos") for collecting the scrap. This highlights a distinctive feature of aluminium scrap management: complex preparation processes are not necessary to facilitate its commercialisation or to ensure profitability.

Regarding transport logistics, 54% of organisations use their own vehicles to deliver the material to buyers; in 27% of cases, the buyer is responsible for collecting the scrap; and in the remaining 18%, the organisations contract external transport services to move the material.

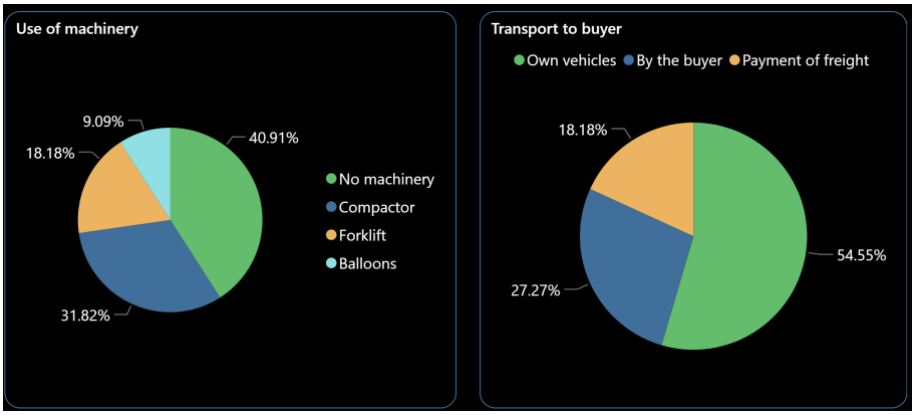

Figure 5. Machinery and Transport Used in Aluminium Scrap Management

4.5. Price and Commercialisation Dynamics

The average purchase price of aluminium scrap paid to waste pickers ranges between COP 5,300 and COP 5,600 per kilogram, while the margin between the selling and purchase price is approximately COP 1,400. Regarding how organisations perceive price levels in the market, a high price is considered to be around COP 8,200, a medium price around COP 6,300, and a low price around COP 4,300. These fluctuations are due to the changes in the national market value of aluminium over the course of the year. In this context, the perception of a medium price dominates for most of the year — particularly between April and October — while higher prices are mainly recorded in December and January.

In response to these price variations, 76% of organisations report switching buyers when market prices rise, while 24% prefer to maintain their existing commercial relationships. Conversely, when market prices drop, only 6% change buyers, 36% continue selling to the same client, and 59% choose to store the material in their ECAs until prices improve. This strategy is feasible because aluminium is easy to prepare and store, allowing organisations to retain material without

compromising its quality while waiting for more favourable selling conditions. Furthermore, the frequent fluctuations in the national market provide organisations with a certain level of flexibility to maximise profitability.

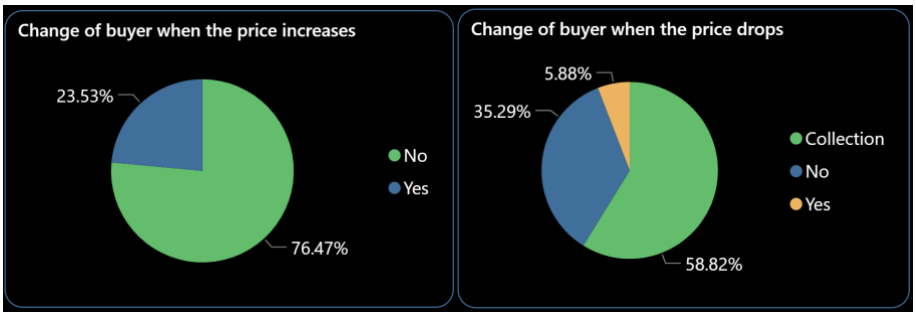

Figure 6. Commercialisation Dynamics

Regarding the frequency of sales, 41% of organisations sell aluminium scrap on a weekly basis, 18% on a fortnightly basis, and 30% on a monthly basis. Bimonthly or quarterly sales account for less than 11% of cases. This indicates that, although some organisations choose to stockpile material when prices fall, delayed sales rarely exceed one month.

4.6. Reporting, Invoicing, and Use of Aluminium Scrap

One of the main findings of the study was the level of formality in commercial transactions involving aluminium scrap. It was found that 76% of organisations issue invoices for 100% of the aluminium they commercialise, while around 12% report invoicing approximately 80%. This indicates that around 88% of organisations have already formalised their commercial processes through the issuance of invoices — a significant step forward in terms of traceability at the initial stage of the value chain, beginning with material collection.

Illustration 4. Leading waste pickers organisations have implemented accounting systems

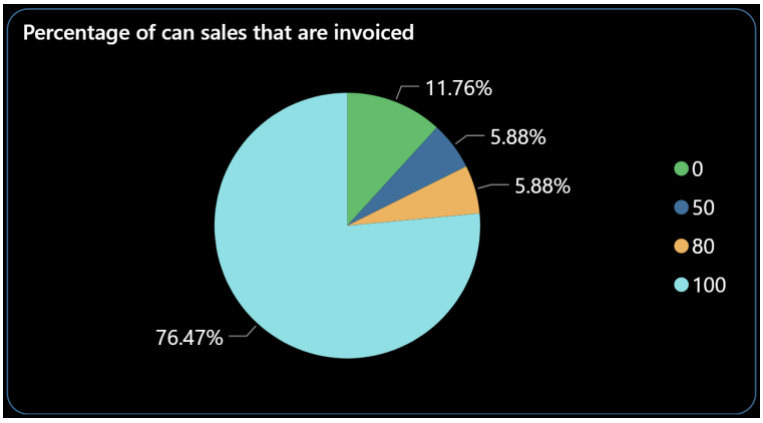

Figure 7. Aluminium Scrap Invoicing Rates

However, an important challenge remains: enabling the 12% of organisations that currently invoice between 0% and 50% of the aluminium they sell to improve their level of formalisation. Among the reasons identified for not issuing full invoices is the fact that many of these organisations report collected materials to the Superintendence of Public Services, as they operate as recognised providers of the public sanitation service in the recovery component within the cities and municipalities where they are active.

These reports are subject to monitoring and inspection by the Superintendence, which may identify inconsistencies or anomalies in the records. If such issues arise, the report is deferred until the observation is resolved, which prevents the organisations from issuing a corresponding invoice for the service provided. Additionally, organisations report that when they declare the full volume of aluminium sold, in some municipalities these volumes are flagged as atypical data, as they exceed the average estimated aluminium generation for that locality. Moreover, it is not acknowledged that aluminium may come from non-residential sources — which raises further questions and can also lead to delays or penalties in the reporting process. For this reason, some organisations choose not to report the full volume of material in official submissions in order to avoid delays or sanctions.

As a result, within the framework of the public recovery service:

- 47% of organisations partially report the volume of aluminium managed,
- 29% report it in full, and
- 23% do not report the material at all.

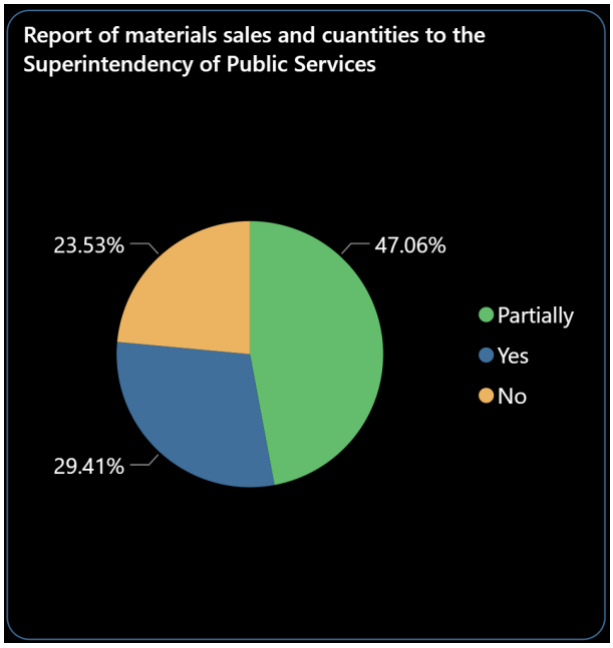

Figure 8. Reporting to the Superintendence of Public Services

Finally, when asked about their knowledge of what happens to the aluminium after it is sold, 41% of organisations stated that they do not know what the buyers do with the material. 35% recognise that the material is exported, although they are unaware of the type of industry it is sent to. 17% believe it is used in industrial or smelting processes to produce new goods, and 6% associate it with domestic transformation processes within Colombia, such as the manufacture of coagulants.

4.7. Incentives and Challenges in Aluminium Scrap Management

To strengthen the management of aluminium scrap, 30% of the organisations indicated a need for support in acquiring machinery such as compactors or forklifts, which would optimise internal processes at the Sorting and Recovery Stations (ECAs). Secondly, 21% of organisations identified freight cost coverage as a key incentive — particularly relevant for those that, as mentioned in the section on material preparation, rely on external transport services to deliver the material to buyers.

Meanwhile, 18% of organisations expressed the need for tax relief on aluminium sales. This issue is particularly significant given that aluminium is one of the most valuable materials in the recyclable market, and for organisations that handle and sell large volumes, this can result in a high tax burden.

Additionally, 21% of organisations indicated that the most necessary incentive relates to the price volatility of aluminium in the market. This unpredictability has led some organisations to stockpile material during low-price periods in the hope of securing better revenues once prices recover.

Other, less frequently mentioned incentives (identified by 3% of respondents) include:

- Working capital support to improve cash flow for purchasing material from waste pickers,
- The creation of monetary incentives to retain waste pickers and discourage them from selling to external intermediaries, and

- New sourcing and customer channels, to broaden access to aluminium available in the market.

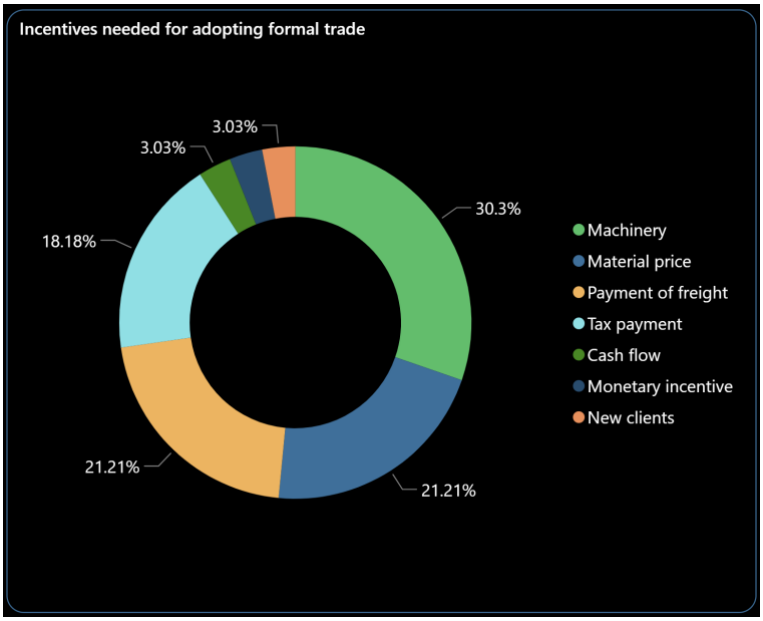

Figure 9. Incentives to Improve Aluminium Scrap Management and Formalisation

As for the main challenges identified in capturing aluminium scrap, 48% of organisations surveyed perceive low prices as a major barrier. While aluminium is among the most valuable materials on the market, profit margins are often narrow because organisations must offer competitive prices to waste pickers in order to prevent the material from being sold to scrap yards or other buyers. An additional 17% consider price volatility to be their primary challenge. Together, these responses suggest that two-thirds of organisations see their income and profit margins from aluminium commercialisation as the main obstacles to expanding their recovery operations.

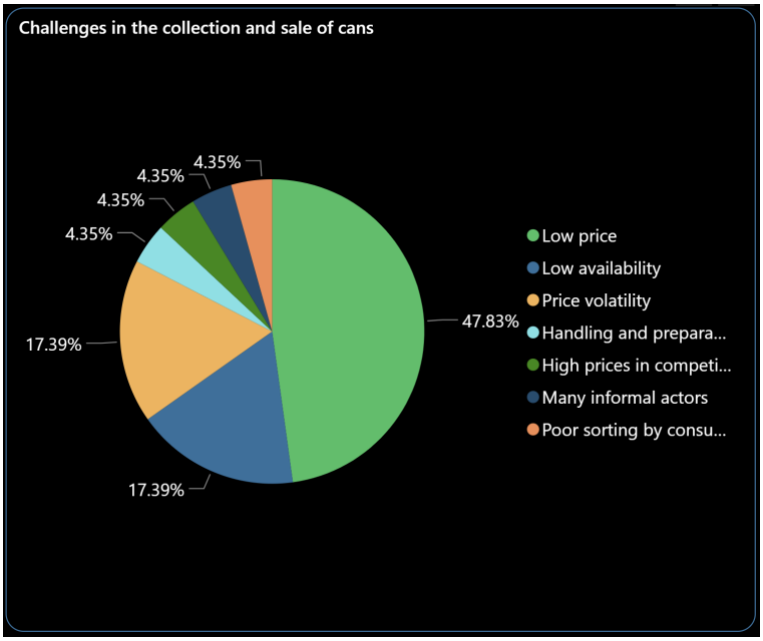

Figure 10. Challenges in Increasing Aluminium Scrap Collection

This outlook confirms that, although aluminium is a high-value material, its profitability is shaped by strong market competition and a highly speculative pricing environment. Supporting this, 9% of organisations pointed to competition from other actors offering higher prices as their main challenge, along with the existence of numerous intermediaries within the value chain.

Finally, 22% of organisations reported that insufficient source separation is a key barrier, as it limits access to recyclable materials that instead end up in landfills. Adding to this, some users — either individually or collectively within residential complexes — collect aluminium independently and sell it directly in exchange for financial returns. This further restricts the access of informal waste pickers to one of the most economically valuable materials in the recovery chain.

4.8. Occupational Health and Safety

In this area, it was found that the main accident risks are associated, in 36% of cases, with cuts and crushing injuries, which occur primarily during the handling of aluminium scrap in the collection and aggregation stages, or during the use of compactors in the material preparation process.

32% of reported risks are linked to poor ergonomic posture, resulting from the repetitive bending movements involved in both waste collection and sorting activities carried out within the ECAs. It is worth noting that this type of risk is inherent to the collection of any recyclable material, as the processes of collection and preparation are broadly similar across material types.

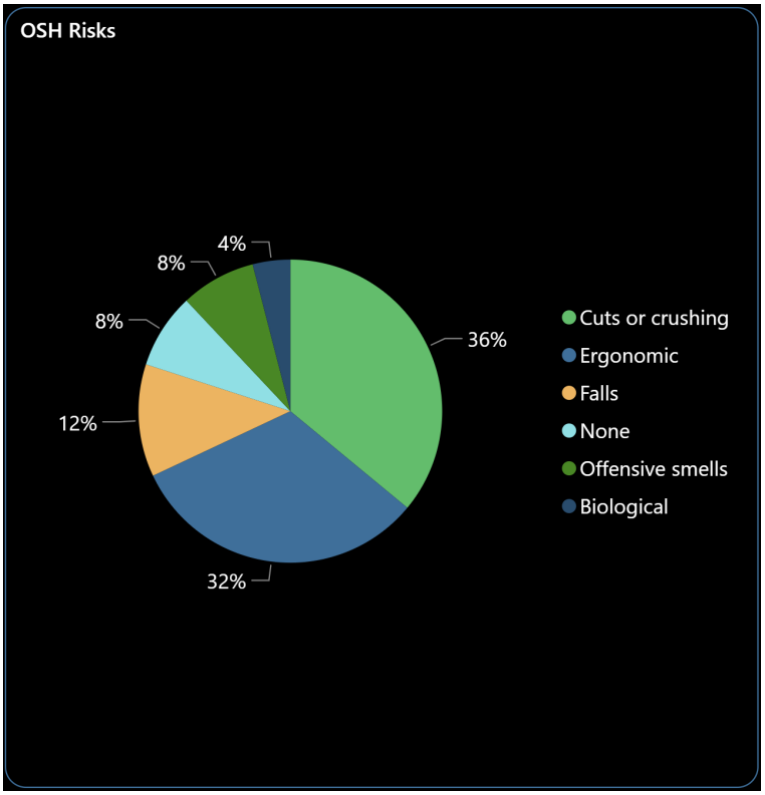

Figure 11. Work-Related Risks in Aluminium Scrap Management

Additionally, 12% of organisations reported that same-level falls pose an ongoing risk during aluminium scrap management. A further 8% reported exposure to biological hazards, while 4% identified risks related to gas inhalation.

Despite these identified risks, only 12% of organisations reported experiencing accidents specifically linked to aluminium scrap management within their ECAs. In terms of preventive measures, 53% of organisations stated that they have delivered training sessions for their waste pickers to help prevent accidents associated with the handling of this material. However, the remaining 47% have not yet implemented such training activities.

Illustration 5. Health and Safety Training as part of the CARE project

5. DIAGNOSTIC: EXPORTERS

As part of the diagnostic assessment of the post-consumer aluminium value chain in Colombia, insights were gathered from three exporting companies. All are involved in the international commercialisation of recycled aluminium, particularly sourced from UBCs and aluminium profiles, and although their operations share certain similarities, they differ in logistical and commercial approaches — offering a broader view of sector dynamics.

Destination of Aluminium and Export Markets: The companies are primarily export-oriented. Exporter A sends abroad 100% of its aluminium, while Exporter B retains a small portion for local sale, particularly to profile manufacturers. The main destinations vary: A exports to Brazil and the United States, while B ships material to Brazil and China. While both companies agree that the aluminium is reincorporated into industrial smelting processes, only one of them has precise knowledge of the end use — noting that it is converted back into aluminium coils for beverage can production. This difference suggests that, although the sector operates within a circular economy framework, exporters do not always have full visibility of the final use of the material they manage. It was found that Exporter C exports to the United States and South America, depending on aluminium demand in each location. However, the company did not provide information about specific clients due to confidentiality reasons.

Illustration 6. Material preparation to be shipped internationally

International Factors and Market Regulation: Regarding the international context, both companies recognise that exchange rates and import tariffs directly affect the profitability of their operations. Aluminium is traded as a global commodity, and the high volatility of the market forces exporters to operate with tight margins, reducing their negotiating power with both suppliers and clients. Fluctuations in the exchange rate — especially when the dollar weakens — are seen as a direct hit to revenue, often requiring exporters to adjust their purchase prices to cover increased costs. This not only introduces financial uncertainty but also contributes to structural instability in the local recycling chain.

Perception of the Competitiveness of Colombian Aluminium: Despite these external challenges, Colombia is seen as having potential for recycled aluminium exports, particularly due to the volume of available material. However, both companies agree that the overall quality of the material is standard and undifferentiated compared to other markets. This limits opportunities to compete based on added value and underscores the need to implement strategies to improve the presentation, cleanliness, and sorting of aluminium at source. Moreover, both actors indicated they lack clear information about the world's leading producers of recycled aluminium — highlighting the limited international benchmarking within the local industry.

Logistical and Operational Barriers: Logistics remain one of the main obstacles to export. High road transport costs, customs procedures, and — in the case of Exporter B — the low density of aluminium, which hinders optimal container use, all affect business efficiency. Exporter B reported that although a container has a capacity of 40 tonnes, in practice it can only transport 20 tonnes due to the volume of the material. These logistical limitations drive up export costs and reduce profit margins, reinforcing the need to strengthen national infrastructure for collection and compacting.

Suppliers and Procurement Conditions: Both companies rely on a balanced mix of intermediaries, waste pickers, and aluminium producers and are not dependent on any single actor. However, their procurement requirements differ significantly. Exporter A imposes strict conditions on how the material must be presented: separation by type, no liquids or contaminants, and a minimum of 600 kg per delivery. In contrast, Exporter B takes a more flexible approach — it does not require minimum volumes or a specific presentation, although it expects separation by type. These differences reflect two distinct supply chain strategies: one prioritising standardisation and operational efficiency, the other favouring adaptability and risk diversification.

Exporter C prioritises sourcing material from suppliers that are not waste picker organisations, mainly due to the quality standards required for the purchased material. In this regard, the company directs its procurement processes towards companies and establishments specialised in metal trading, which have greater technical and operational capacity to ensure the homogeneity, traceability, and conditions required for export.

Quality Control and Handling of Non-Conformities: Quality management is essential for both companies, though their approaches vary. Exporter A applies discounts or returns if the material contains more than 1.5% contaminants, while Exporter B immediately inspects the material upon unloading and returns it if it does not meet standards, without applying discounts. Both companies agree that price is not affected by presentation, but stress the importance of receiving clean, sorted material. This is especially relevant for the professionalisation of waste picker organisations, as better quality directly translates into higher prices and more stable relationships with exporters.

Payment Methods and Commercial Conditions: Financially, both companies offer reliable and agile payment terms. Exporter A uses bank transfers or remittances, while Exporter B is noted for paying on the same day as delivery (or the next day if the delivery is late). This quick payment is a significant incentive for suppliers and can play a key role in strategies to formalise and retain waste pickers.

Agreements and Supply Chain Relationships: A notable point of contrast is the existence of formal agreements or alliances. Exporter A has established partnerships with some suppliers to ensure an efficient supply chain, including technical support, knowledge transfer, and occasionally financial assistance. Exporter B, however, avoids such agreements, arguing that they could distort the market, since aluminium prices change daily. This reveals two business philosophies: one focused on building strategic relationships, and another on maintaining flexibility in a fluctuating market.

Customer Requirements and Material Preparation: Both exporters stated that their clients demand certain standards for volume and material presentation. Exporter A's clients require a minimum of 112 kg per shipment and specific conditions for delivery, which necessitates pre-treatment of the material. Exporter B must also ensure the material is compacted for transport efficiency, though it does not report a minimum volume requirement. These customer demands underscore the importance of strong supply chains capable of ensuring not only adequate volumes but also technical and logistical compliance.

Customer Returns: Regarding customer returns, only Exporter A reported having experienced such cases — typically due to moisture in the material, which leads to price reductions. Exporter B stated that it has never had returns, attributing this to clear inspection procedures and well-defined commercial agreements. This difference illustrates how quality control can have a direct impact on revenue and commercial stability.

Price Formation and Volatility Factors: The price of aluminium is determined by the international market and heavily influenced by the US dollar. Both companies agree that this external variable shapes negotiations with suppliers and can lead to price wars, unfair competition, and shrinking

profit margins. One of the companies even mentioned that the war in Ukraine had a significant impact on global aluminium prices, confirming the sensitivity of the sector to geopolitical events.

Limitations to Increasing Domestic Procurement: When asked about the potential to increase purchases of domestically sourced recycled aluminium, exporters cited barriers such as high taxes, inconsistent quality, price issues, and elevated logistics costs. For now, exporting remains more profitable than selling locally. This perception limits the development of the domestic market and reveals the need for public policies that encourage local transformation of aluminium.

Outlook on Partnerships with Waste Pickers: Despite the challenges mentioned, both companies expressed a willingness to establish partnerships with waste picker organisations. Exporter A envisions a relationship based on mutual strengthening, including technical support and capacity building. Exporter B, on the other hand, believes that improving the price paid for the material would be a sufficient incentive to increase collection volumes. This shared openness to collaborating with the recycling sector could serve as a starting point for more inclusive and sustainable integration strategies.

6. DIAGNOSTIC: CAN MANUFACTURERS

As part of this diagnostic, discussions were also held with aluminium can manufacturers operating in Colombia. These conversations revealed key insights regarding the origin of materials, the potential for local processing, and the main barriers to managing post-consumer aluminium scrap.

In the case of Can Manufacturer A, it was reported that 100% of the aluminium used in their products is imported from China and Thailand, whereas Can Manufacturer B imports most of its aluminium from Brazil. Both companies confirmed that they do not have complete clarity on the origin of the recycled aluminium within their suppliers' value chains. However, they stated that the material they use contains at least 90% recycled aluminium, which is used exclusively for the production of cans.

Regarding the possibility of developing an aluminium processor in Colombia for the production of can sheet, both companies agreed that there are structural challenges that make this industry unviable in the country. First, setting up mills and furnaces for this activity requires significantly high investments, far exceeding those required for plastic or other recycling plants. Second, it would be necessary to build a national network of suppliers capable of collecting and continuously supplying most of the post-consumer aluminium generated in the country, a condition that is currently not met.

In the Colombian context, the can manufacturers pointed out that one of the main barriers to aluminium scrap management is the informality of certain actors who do not issue invoices and engage in speculative practices due to price volatility. These actors often purchase material from independent or informal waste pickers, many of whom are homeless or unaffiliated with any waste picker organisation. In this regard, the companies believe that the country lacks a

regulatory framework to set a standardised price for aluminium scrap — a measure that, if implemented, could help reduce informality across the post-consumer aluminium value chain.

They also raised the possibility of creating specialised aluminium HUBs to help capture material that currently goes unrecorded due to non-invoicing practices among various actors in the chain. However, they acknowledged that such a proposal would face significant challenges, particularly due to the deep entrenchment and dominance of the traditional scrap dealer and exporter-based model, which is well-established in Colombia.

Finally, the can manufacturers stressed the important role of brands in promoting proper waste separation practices and in strengthening the technical and operational capacities of waste pickers for the collection of recoverable materials, including aluminium. They also emphasised the need to develop traceability mechanisms to gain more detailed knowledge about the origin of aluminium scrap, enabling it to be recognised within Extended Producer Responsibility (EPR) schemes.

7. OTHER ACTORS: BRANDS AND PROCESSORS

Among the key actors in the aluminium value chain are the brands—that is, companies placing products on the market packaged in aluminium containers. In the Colombian context, this group is mainly linked to the carbonated, alcoholic, and energy drinks industries.

In this regard, a beverage brand emphasised the need to develop mechanisms to make aluminium traceability visible in Colombia. This is particularly important given that Colombia lacks the infrastructure for aluminium processing, meaning that post-consumer material—as well as imported aluminium—is exported to countries with the capacity for transformation.

However, under Colombia's current Extended Producer Responsibility (EPR) regulations, only in-country transformation is recognised as valid compliance. As a result, the need was raised for traceability and due diligence mechanisms that allow for accounting of aluminium that has been effectively collected in Colombia, even if it is later exported—as long as its traceability can be clearly documented. This would enable the material to be considered within the legal EPR compliance targets.

To achieve this, it is proposed to link all actors across the value chain, beginning with waste pickers, who carry out the collection work, and continuing through national exporters, international processors, and can manufacturers in Colombia. Such articulation would allow the management of the material to be documented in an organised and transparent manner. The beverage brand, for its part, has already begun internal efforts to investigate aluminium traceability with its suppliers, but has encountered the same barriers raised by the can manufacturers: fragmentation of supply sources and lack of established systems to document the precise origin of the material.

Another relevant actor included in this diagnostic was Processor A which is operating one of the largest integrated aluminium rolling and recycling centres in Latin America. The facility has a recycling capacity of approximately 490,000 tonnes annually, processing over 20 billion cans per

year. It produces coils for sheet used in beverage cans, largely sourcing post-consumer aluminium under a circular economy model. The facility is also ASI Chain of Custody certified and ranks among the largest of its kind globally.

According to information provided by the company, a close commercial relationship with the Colombian market has been established as part of its regional sourcing strategy. The processor operates its own collection centres and maintains a near-100% collection rate in its home country, demonstrating a highly efficient system. However, it supplements this supply with imports from Colombia, receiving between 7,500 and 15,000 tonnes of aluminium annually. Its Colombian partners include two main exporters and other actors, with whom it anticipates joint monthly growth of between 500 and 600 tonnes.

The processor identified international price competition—particularly from markets like the United States—as the primary barrier to consolidating new Colombian suppliers. In addition, while there is no single global standard, its customers require a high proportion of recycled content in processed aluminium. This underscores the importance of strengthening supply chains aligned with circularity and traceability principles.

Processor B was identified as a relevant actor in the mapping. The company was established with the objective of processing aluminium and implementing industrial processes focused on material recovery.

However, at the time of data collection, Processor B did not yet have a consolidated supply chain to ensure a continuous flow of raw material. The company was in an early phase of operations, conducting machinery testing and calibration. For this purpose, it had made occasional aluminium purchases from waste picker organisations, as well as acquiring lots of material at the port prior to export.

Additionally, the local context presents high competition for access to material, as several aluminium exporting companies already operate in the area and have secured the majority of available suppliers. In this scenario, Processor B has attempted to position itself in the market through price-based competition strategies. However, the prices offered by established processors for pressed cans and aluminium blocks are comparable, limiting its ability to differentiate.

As a result, the company has yet to secure a stable position in the local market or guarantee a steady supply flow—representing one of the main challenges for fully launching its operations. This context highlights the entry barriers faced by new processors in the aluminium value chain, particularly in regions where commercialisation and export systems are already highly structured.

8. FLOW OF THE RECYCLED ALUMINIUM VALUE CHAIN IN COLOMBIA

The Illustration below provides a visual overview of the aluminium value chain in Colombia, with a focus on the post-consumer recovery and recycling of Used Beverage Cans (UBCs). It maps the main actors involved, highlights the direction and reliability of information flows, and identifies key challenges such as fragmentation, limited national processing, and export-driven dynamics. This diagram is based on fieldwork conducted as part of the CARE Project and supports efforts to improve coordination, traceability, and responsible sourcing across the aluminium recycling system.

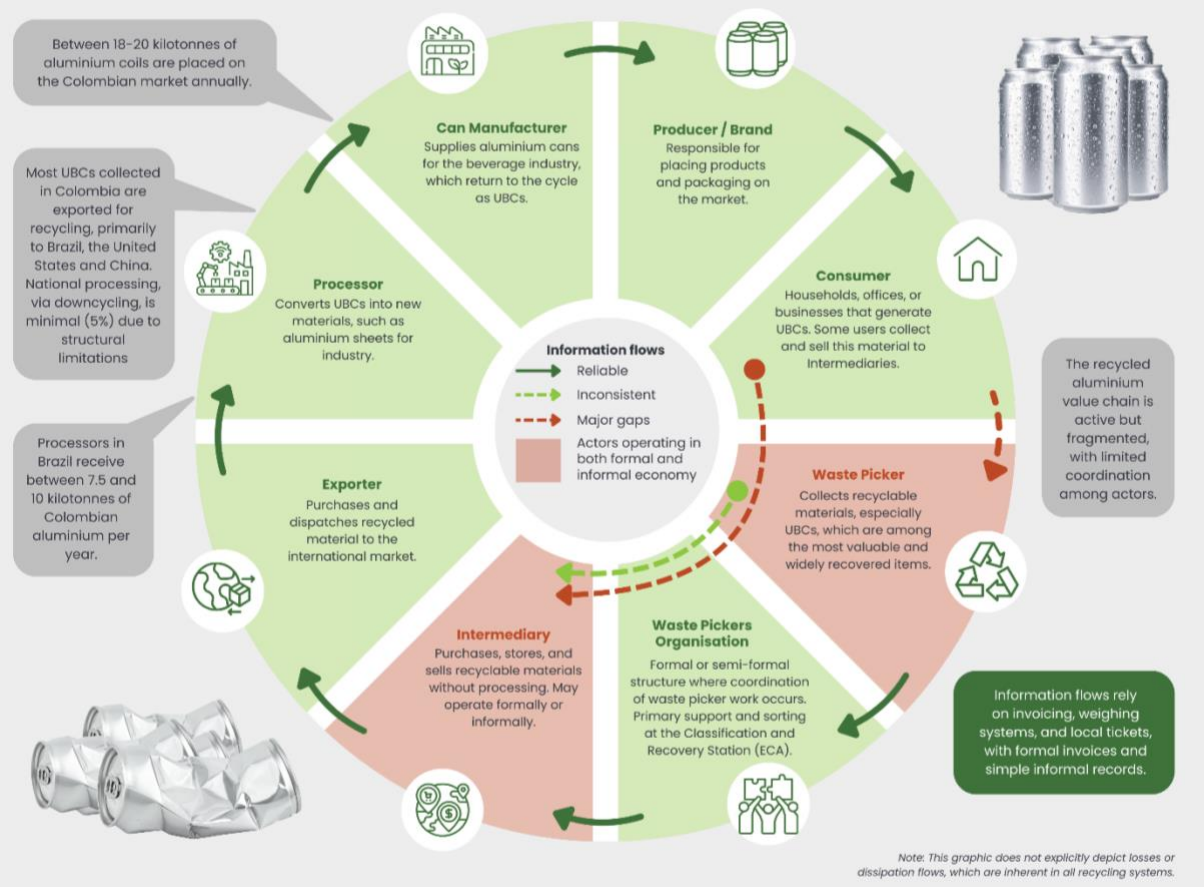

Illustration 7. Diagram of the Recycled Aluminium Value Chain Identified in Colombia

The flow of post-consumer aluminium scrap in Colombia begins with its primary collection, carried out predominantly by waste pickers operating in both residential and commercial settings. This first stage is critical, as 74% of the collected material originates from households, while the remaining 26% comes from sectors such as beverages, restaurants, and entertainment.

Once collected, the material is transported to Sorting and Recovery Stations (ECAs) or collection centres, where it is sorted, weighed, prepared, and readied for sale. At this point, aluminium may be kept loose (53%) or compacted (47%), depending on the available infrastructure and associated logistics costs. Compacting is more common in regions that require intermunicipal transport or export logistics.

From the ECAs, the material follows three main routes:

- Sale to intermediaries or scrap yards: These actors purchase aluminium in smaller volumes, store it, and resell it — typically to exporters or other commercial intermediaries. They represent an agile route for moving the material, especially when ECAs lack cash flow or long-term storage capacity.
- Direct sale to exporters: In this route, material is sold in larger volumes (between 122 kg and 600 kg), particularly when buyers operate intermediate collection centres. Exporters then ship the aluminium to international markets, mainly for smelting and industrial processing.
- Sale to local processors: This still-emerging route accounts for a small share of the total volume and is observed primarily in Bogotá. It is characterised by sporadic purchases, variable prices, and high logistical requirements (minimum 500 kg), limiting its scalability as a management pathway.

Once in the hands of exporters, the aluminium is compacted and quality-checked for shipment. The main destinations are countries with well-developed industrial infrastructure for smelting and processing aluminium into coils, sheets, or intermediary products. The average container volume varies depending on material density and buyer requirements.

In the case of international processors, Colombian post-consumer aluminium is used in industrial processes under circular economy models. The recycled material is reintroduced into the production of new packaging, coagulants, or other products, partially closing its life cycle.

In parallel, can manufacturers and beverage brands operating in Colombia use imported aluminium, which typically contains high levels of recycled content but lacks traceability regarding its origin. While they acknowledge the value of recycled aluminium, they do not actively participate in the local chain, highlighting a structural disconnect that hinders their integration into the Extended Producer Responsibility (EPR) model.

In summary, the journey of post-consumer aluminium in Colombia follows a path that begins with waste pickers, proceeds through collection and preparation processes at ECAs, continues to intermediaries or exporters, and concludes — for the most part — in processing facilities abroad. This flow reflects a dynamic yet fragmented chain, with multiple nodes operating under diverse logistical, technical, and commercial conditions, and with limited traceability between origin and final destination.

8.1. Material flow of aluminium beverage cans in Colombia

Figure 12 presents a Sankey diagram illustrating the observed material flows of aluminium beverage cans in Colombia over a one-year period. The figure provides a mass-balanced representation of how aluminium enters the Colombian market as coil, is transformed into beverage cans, placed on the market, and subsequently recovered and managed at end of life.

The diagram begins with the supply of aluminium coil to the Colombian can manufacturing sector. This material is converted into beverage cans, a portion of which becomes pre-consumer scrap during the manufacturing process. Consistent with current industrial practice and the

absence of domestic remelting and rolling capacity, this pre-consumer scrap is exported for recycling. The remaining material is placed on the Colombian market as finished beverage cans and consumed within the country.

Following consumption, the diagram shows the generation of used beverage cans (UBCs) and their subsequent distribution across three end-of-life pathways. The largest share of UBCs is exported for recycling in external markets, reflecting the structural role of international recycling infrastructure in closing the aluminium loop for Colombia. A smaller share is diverted to domestic non-can applications, such as industrial or chemical uses, while a comparatively minor fraction is lost due to non-collection or other inefficiencies.

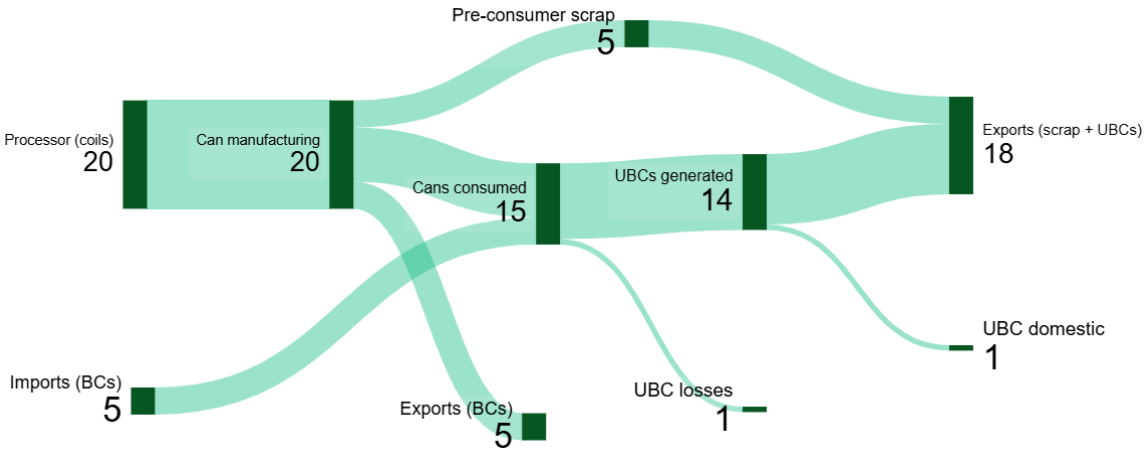

Illustration 8. Estimated material flows of aluminium beverage cans in Colombia

Two recycling indicators can be derived from the observed flows. Under a recovery-based, location-neutral definition, recycled material includes UBC exports (≈13 kt/year) and domestic non-can uses (capped at ≈1 kt/year), resulting in ≈14 kt recovered out of 15 kt placed on the market, or ≈93%. Under a stricter can-to-metal definition, only UBC exports are counted, giving ≈13 kt recycled out of 15 kt, or ≈87%.

Overall, the Sankey diagram highlights a system characterised by high recovery rates but externalised recycling, where the majority of material is recovered and reprocessed outside national borders. This representation helps to clarify apparent discrepancies between commonly cited national recycling rates and the observed performance of aluminium beverage cans, which benefit from strong market value and well-established collection networks.

The methodology used to reconstruct these flows, including data sources, assumptions, treatment of ranges, and mass-balance logic, is described in detail in Annex I.

9. SUMMARY TABLE: ACTORS, BARRIERS AND OPPORTUNITIES IN THE POST-CONSUMER RECYCLED ALUMINIUM VALUE CHAIN IN COLOMBIA

Actor	Identified Barriers	Potential Opportunities
Waste Pickers (Recognised and Informal)	- Ongoing informality in some processes. - Difficulties in reporting 100% of the material to the Superintendence of Public Services. - Price volatility and limited margins. - Limited access to machinery, transport, and working capital. - Occupational risks without sufficient coverage. - Weak links with downstream actors.	- High participation in material collection. - Significant progress in invoicing and formalisation. - Ability to store material while waiting for better prices. - Potential to form alliances with exporters. - Scope for operational and administrative strengthening.
Exporters	- High dependence on exchange rate and international prices. - Elevated logistics costs (road transport, low aluminium density). - Lack of unified procurement standards. - Partial lack of knowledge about the final destination of the material. - Variable commercial relationships depending on supplier.	- High international demand for recycled aluminium. - Installed capacity for purchasing, compacting, and exporting. - Willingness to work with organised waste pickers. - Potential to implement traceability protocols and sustainable supply agreements.
Processors	- No processing takes place in Colombia due to lack of infrastructure. - Unfeasibility of installing plants due to insufficient scale. - High global concentration of the sector. - Informality in part of the national supply chain.	- Possibility of participating in traceability chains that account for exported material as part of EPR compliance. - Interest in expanding supplier networks if traceability improves.
Can Manufacturers	- Total reliance on imported aluminium. - Lack of traceability regarding the origin of recycled content. - Difficulty determining whether their suppliers use Colombian post-consumer aluminium. - Informality among some intermediaries.	- Interest in recycled materials with high post-consumer content. - Opportunity to participate in traceability schemes and chain integration. - Receptiveness to circular economy models.
Brands (Beverage and Food Companies)	- No mechanisms in place to account for aluminium that is collected and exported as valid EPR compliance. - Lack of information about the destination and processing of material. - Limited coordination with waste pickers and exporters.	- Interest in closing the loop on their packaging. - Internal initiatives focused on traceability and supply chain research. - Potential to co-finance collective actions for traceability and consumer education.

10. CONCLUSIONS

1. The post-consumer recycled aluminium value chain in Colombia is active but fragmented. While waste pickers have a strong presence in the collection stage, there is limited coordination with downstream actors involved in local processing. The prevailing commercial model is export-oriented, which restricts the development of a strong domestic industry for aluminium recycling and processing.
2. Waste pickers play a crucial role in sourcing post-consumer aluminium, particularly from residential and commercial sources. However, their effective integration into the value chain faces barriers related to informality, a lack of logistical and financial incentives, and uneven technical conditions, such as access to machinery and transport.
3. The export model demonstrates operational efficiency but also reproduces dynamics of market concentration, speculation, and low traceability. Exporters benefit from international market margins but operate with inconsistent criteria regarding quality, presentation requirements, and relationships with suppliers. While there is willingness to work with organised waste picker groups, standardised mechanisms for long-term partnerships are lacking.
4. Processors and can manufacturers, both domestic and international, confirm a structural disconnect from the Colombian recycling chain. Although they recognise the value of recycled material, achieving full traceability of aluminium from source to transformation remains a critical challenge. The lack of visibility into the final destination of the material—particularly among intermediaries—further reinforces this gap.
5. There are structural constraints that hinder the development of a national aluminium processing industry, such as the lack of infrastructure, and the required scale of material aggregation. However, opportunities exist in developing traceability systems, establishing collection hubs, and better coordinating actors from collection through to production.
6. Waste picker organisations have made progress in formalisation and invoicing processes, but they continue to face regulatory and operational uncertainty, especially in relation to reporting to the Superintendence of Public Services. This limits their ability to invoice 100% of the material collected and, consequently, to officially record their contribution to the Extended Producer Responsibility (EPR) system.

11. RECOMMENDATIONS

1. Establish traceability mechanisms for post-consumer recycled aluminium that document the origin, flows, and final destination of the material. This would make the role of waste pickers in the value chain more visible and enable recognition of exported aluminium under the Extended Producer Responsibility (EPR) framework. The development of due diligence protocols could be a key initial action.
2. Promote strategic alliances between waste picker organisations, exporters, and processors aimed at building technical capacity, establishing purchase agreements with transparent conditions, and improving material quality. These partnerships should be

based on principles of equity and shared responsibility, not solely on volume-based incentives.

3. Create economic and technical incentives to improve the preparation and logistics of aluminium at the source, including provision of basic equipment (compactors, forklifts), co-financing of transport, and support for the working capital of ECAs. These measures could directly impact the profitability and formalisation of recycling operations.
4. Develop shared minimum technical standards between exporters and waste pickers to harmonise expectations around presentation, sorting, and quality of aluminium. The creation of joint operational guides or manuals would support more stable commercial relationships and reduce the risk of rejection or losses.
5. Promote public policies that encourage the development of regional centres specialised in aluminium aggregation and pre-processing, drawing on the experience of models implemented in countries such as Brazil. These hubs could strengthen the circular economy of aluminium without requiring large-scale industrial transformation facilities.
6. Support waste picker organisations in strengthening their administrative and legal capacity to fully report to the public services system, reducing the risk of inconsistencies or anomalies in records and ensuring timely payment for recovery services — essential to their sustainability.
7. Engage beverage and food brands in co-financing strategies or initiatives to integrate the post-consumer aluminium value chain, acknowledging their key role under the EPR framework and their interest in closing the loop on their packaging. Their participation could be crucial in developing stronger traceability systems, consumer education efforts, and recycler loyalty schemes.

12. GLOSSARY

- **Brand**: A company that places products on the market in packaging, and is responsible—under the EPR framework—for organising and financing the management of the resulting waste.
- **Circular economy**: A sustainable development model based on prevention, reuse, recycling, and recovery of materials, aiming to keep resources in use for as long as possible, thereby reducing raw material consumption and waste generation.
- **Compacting**: A process through which the volume of recycled material—such as aluminium—is reduced using machinery, in order to ease storage and transport.
- **ECA (Sorting and Recovery Station, or Estación de Clasificación y Aprovechamiento in Spanish)**: A facility typically operated by waste picker organisations, where materials are sorted, weighed, and prepared before being sold to the next actors in the chain.
- **EPR (Extended Producer Responsibility)**: An environmental policy instrument that obliges producers to organise, finance, and ensure the proper handling of waste resulting from the products they sell, including collection, transport, treatment, final disposal, or recovery.

- **EPR Report**: A mandatory report submitted to the environmental authority documenting a producer's compliance with collection and recovery targets for packaging waste, as part of the Extended Producer Responsibility (EPR) framework.
- **Formalisation**: The process by which a waste picker organisation or chain actor gains legal, administrative, and technical recognition to operate under standards set by current regulations.
- **Intermediation**: A commercial relationship in which an actor purchases recyclable materials from small suppliers (e.g. waste pickers) to resell them to third parties, such as exporters or processors, generating economic margins without necessarily adding value to the material.
- **Post-consumer aluminium scrap:** aluminium waste collected from households, businesses, or public spaces after use, and managed through collection, sorting, and commercialisation processes — typically by waste pickers, ECAs, and intermediaries.
- **Preparation**: A set of operational actions that prepare recycled material for commercialisation, including compacting, packaging, weighing, or cleaning, depending on the type of buyer and destination.
- **Processor**: An industrial actor who transforms recycled materials into raw materials or intermediate products—such as sheets, coils, or alloys—which can later be used by can manufacturers.
- **Recycled aluminium:** material that has undergone industrial processing (e.g. smelting or rolling) and has been reintroduced into manufacturing, such as in the production of new cans or aluminium products.
- **Recycled aluminium value chain**: A set of interrelated links involved in the management of post-consumer aluminium, from its generation and collection to transformation or export. It includes waste pickers, aggregation centres, traders, exporters, processors, can manufacturers, and brands.
- **Recovery**: A complementary activity to the public cleaning service, consisting of the collection, sorting, transformation, or reintegration of waste into production or consumption cycles, aiming to valorise materials that would otherwise be sent to landfill.
- **Sorting and Recovery Station (ECA)**: Infrastructure used to receive, store, and organise recyclable materials collected by waste picker organisations, typically without additional transformation processes.
- **Traceability**: The ability to track a material throughout the entire value chain, from origin (collection) to final destination (transformation or disposal), enabling verification of regulatory and environmental compliance.
- **UBC (Used Beverage Can):** A specific category of post-consumer aluminium scrap derived from aluminium cans, commonly recovered and recycled.
- **Waste picker**: A person who regularly carries out the collection, transport, and sorting of recyclable materials, officially recognised under Colombian law as a provider of public cleaning services in the recovery component

13. ANNEX I. METHODOLOGY NOTE – MATERIAL FLOW RECONSTRUCTION FOR ALUMINIUM BEVERAGE CANS IN COLOMBIA

1. Purpose of the methodology

This methodology note documents the approach used to reconstruct the material flows of aluminium beverage cans in Colombia and to represent those flows in a mass-balanced Sankey diagram. The analysis is based primarily on qualitative and quantitative information gathered through **interviews with multiple value chain actors**, complemented by internal consistency checks and standard material flow analysis principles.

The purpose of this annex is to:

- Make all assumptions explicit,
- Clarify the use of ranges versus point estimates,
- Justify the selection of specific values used in the Sankey diagram,
- Ensure transparency and reproducibility of the analysis.

2. Data sources

The primary data sources for this analysis were:

- **Semi-structured interviews** with actors involved in aluminium can manufacturing, scrap aggregation, export, and recycling.
- Market observations and estimates shared during those interviews, including references to trade flows, capacities, and recovery performance.
- Qualitative descriptions of operational practices (e.g. manufacturing yields, collection behaviour, export logistics).

No single interview was treated as authoritative. Values were triangulated across interviews, and where discrepancies or uncertainty existed, **ranges** were retained and documented.

3. System boundaries and accounting framework

The material flow analysis covers the following stages within Colombia:

1. Supply of aluminium coil to the Colombian market
2. Manufacturing of beverage cans
3. Placement of cans on the domestic market (consumption)
4. Generation of used beverage cans (UBCs)
5. Post-consumer outcomes:
    - Export for recycling
    - Domestic non-can uses
    - Losses (non-collected or otherwise unrecovered)

The analysis is conducted on an **annual basis** and expressed in **tonnes per year**. International remelting and rolling processes are outside the system boundary and are treated as terminal destinations for exported material.

4. Treatment of ranges and selection of Sankey values

Interview data frequently provided **ranges** rather than precise figures. These ranges reflect normal commercial confidentiality, market volatility, and estimation based on operational experience rather than formal reporting systems.

For the Sankey diagram, **single point values** were required to ensure mass balance and visual clarity. The following principles were applied when selecting values:

- Where a range was provided, the **upper bound** was selected when:
    - It was repeatedly cited across interviews, and
    - It aligned with downstream flow estimates (e.g. exports).
- All selected values remain **within the stated interview ranges**.
- The original ranges are preserved and documented in this annex.

5. Key parameters: ranges and selected values

5.1. Aluminium coil supplied to Colombia

- **Range reported in interviews:**
  18,000–20,000 tonnes/year
- **Selected value for Sankey:**
  20,000 tonnes/year

Rationale:
The upper bound (20 kt) was selected because it aligns with observed downstream can production volumes and export flows. Using 18 kt would require either lower exports or higher losses, neither of which was supported by interview evidence.

5.2. Can manufacturing output

- **Implied manufacturing yield:** ~75%
- **Resulting outputs from 20,000 t coil:**
    - **Cans placed on the market:** ~15,000 t/year
    - **Pre-consumer scrap:** ~5,000 t/year

Range context:
While yields were not stated explicitly as percentages, multiple interviews referred to a difference of approximately **5,000 tonnes** between coil supplied and cans placed on the market, consistent with standard can manufacturing scrap rates.

Selected values for Sankey:

- Cans manufactured: **20,000 t**
- Pre-consumer scrap: **5,000 t**
- Cans consumed domestically: **15,000 t**

5.3. UBCs generated

- **Assumption:** 1:1 mass relationship between cans consumed and UBCs generated
- **Result: 15,000 t/year UBCs generated**

This assumption is standard for short-life packaging and was not contradicted in interviews.

5.4. UBC exports

- **Range reported in interviews:**
  12,000–13,500 tonnes/year
- **Most frequently cited figure:**
  ~13,000 tonnes/year
- **Selected value for Sankey:**
  13,000 tonnes/year

Rationale:
This value was consistently referenced and is compatible with both export logistics and importing capacity described during interviews.

5.5. Domestic use of UBCs (non-can applications)

- **Range reported in interviews:**
  1,000–1,500 tonnes/year
- **Selected value for Sankey:**
  1,500 tonnes/year

Rationale:
The upper bound was selected to avoid overstating exports and to reflect the continued presence of domestic downcycling uses (e.g. chemical or industrial applications).

5.6. UBC losses

- **Calculated residual:**
  ~1000 tonnes/year
- **Implied range:**
  Approximately **3–5% of UBCs generated**

Rationale:
Losses were not directly quantified in interviews but were described as minimal due to the high value of aluminium cans. Losses were therefore calculated as the residual required to close the mass balance after accounting for exports and domestic use.

5.7. Recycling rate interpretation

Two recycling indicators can be derived from the observed scenario:

1. **Recovery-based recycling (location-neutral):**
   - Recycled = exports + domestic use
   - **~14,000 t / 15,000 t = ~93%**

2. Can-to-metal recycling (excluding downcycling):
    - Recycled = exports only
    - ~13,000 t / 15,000 t = ~87%

Both figures are substantially higher than national recycling rates derived from multi-material waste statistics, which reflects the specific economics and collection dynamics of aluminium beverage cans.

5.8. Limitations

- The analysis relies on **interview-based estimates** rather than audited trade or production statistics.
- Imports of empty or filled cans were not modelled as separate inflows, as the focus was on net material placed on the Colombian market.
- Stock changes and time lags between consumption and collection were not considered.

These limitations are inherent to exploratory material flow analysis in contexts with limited public data availability.

6. Implications for data systems and policy

The reconstructed flows highlight several structural issues relevant to policy and system design:

1. Need for improved material flow databases
   Existing national statistics often aggregate materials and obscure high-performing streams such as aluminium cans. Disaggregated, material-specific databases would significantly improve accuracy.
2. EPR system design and interpretation
   Extended Producer Responsibility frameworks that require domestic transformation may misrepresent performance in systems where recycling is **geographically distributed**. Recognition of verified export-for-recycling pathways is essential.
3. Traceability and verification
   The high share of exports underscores the importance of robust traceability systems capable of linking post-consumer collection to verified recycling outcomes abroad, even in the absence of batch-level tracking.
4. Policy alignment with market reality
   The observed scenario suggests that policy targets based solely on domestic recycling capacity risk penalising efficient recovery systems. Policy instruments should focus on **actual recovery and recycling outcomes**, not only on national closure of material loops.

This methodology annex is intended to support transparency, facilitate informed interpretation of the Sankey diagram, and provide a robust basis for further technical, regulatory, or policy-oriented work.