

Consumer Awareness and Use of Reverse Logistics Mechanisms: A Survey-Based Study from the Wielkopolska Region, Poland*

Natalia PAWLAK and Dominika PODEMSKA

Poznan University of Technology, Poland

Correspondence should be addressed to: Natalia PAWLAK, natalia.pawlak@put.poznan.pl

*Presented at the 47th IBIMA International Conference, 29-30 June 2026, Madrid, Spain

Abstract

The aim of the article is to examine two areas: the popularity and importance of reverse logistics mechanisms among working-age consumers in the Wielkopolska Voivodeship. The creation of this publication is based on three methods: analysis and criticism of literature (desk research), preliminary research conducted using the CAWI method, analysis and interpretation of research results, taking into account respondents' answers to open questions. A study on the popularity and importance of reverse logistics mechanisms among consumers yielded interesting and diverse results that may shed light on current trends and consumer expectations in this area. Even though more than half of the respondents declared that they did not know the concept of reverse logistics, all respondents referred to the use of its mechanisms. This means that even though the respondents do not know the definition of the concept, they use these mechanisms in their everyday lives. Respondents appreciate the possibility of returning goods free of charge in exchange for an immediate refund to the account or in cash instead of a gift card.

Keywords: reverse logistics, preliminary research, competitiveness

Introduction

Background and Importance of Reverse Logistics

Modern development trends and the steadily growing volume of waste continuously elevate the significance of reverse logistics in global production and distribution systems. The rapid expansion of industrial activities, mass consumption, and e-commerce has intensified the pressure on natural resources and on waste management infrastructures worldwide. In this context, reverse logistics is no longer limited to the simple physical movement of goods in the opposite direction along the supply chain. It has evolved into a strategic component of sustainable business management, serving as the operational backbone for circular economy implementation and for achieving the United Nations Sustainable Development Goals related to responsible production and consumption.

The implementation of reverse logistics mechanisms contributes directly to enhancing business competitiveness. Companies capable of efficiently handling product returns, recovering materials, and minimizing waste disposal costs gain both economic and reputational advantages. These advantages stem from the fact that consumers are becoming increasingly aware of the ecological consequences of production and distribution processes. As a result, they tend to prefer products and brands that are demonstrably sustainable, transparent, and socially responsible. In parallel, investors, regulators, and other stakeholders are pushing for accountability throughout the entire product life cycle, including the end-of-life phase.

This shift in consumer and stakeholder expectations is reflected in measurable market trends: the growing demand for eco-friendly products, biodegradable or reusable packaging, and easy return systems that minimize

Cite this Article as: Natalia PAWLAK and Dominika PODEMSKA Vol. 2026 (8) "Consumer Awareness and Use of Reverse Logistics Mechanisms: A Survey-Based Study from the Wielkopolska Region, Poland " Communications of International Proceedings, Vol. 2026 (8), Article ID 4724726, <https://doi.org/10.5171/2026.4724726>

the environmental footprint. Reverse logistics, by managing the recovery and redirection of goods and materials, becomes the tangible expression of corporate environmental responsibility. It transforms sustainability declarations into concrete actions visible to customers—whether through packaging collection programs, product take-back initiatives, or the possibility to return goods free of charge with immediate refunds.

Beyond market expectations, the growing importance of reverse logistics also arises from legal and institutional pressures. The degradation of natural ecosystems, combined with the financial and social costs of excessive waste generation, has led legislators—particularly within the European Union—to establish strict requirements for the recovery, recycling, and disposal of products and materials. In consequence, waste is increasingly viewed not merely as an inevitable by-product of economic activity, but as a potential source of secondary raw materials, cost savings, and innovation.

Reverse logistics therefore occupies a dual role: it is both an environmental necessity and an economic opportunity. When properly implemented, it allows businesses to recover value from used products, extend material lifecycles, and reduce reliance on virgin resources. At the same time, it supports corporate resilience by mitigating the risks associated with volatile raw-material prices and supply disruptions. For these reasons, reverse logistics is now recognized as an essential dimension of sustainable supply chain management.

Nevertheless, the implementation of reverse logistics systems entails considerable financial, administrative, and legal challenges. Companies must invest in infrastructure for collection, sorting, and storage; develop partnerships with certified recyclers and refurbishers; and maintain traceability of materials in compliance with reporting standards. The full potential of reverse logistics can only be achieved when these operational systems are aligned with national and supranational regulatory frameworks.

Legal and Regulatory Context

Enterprises operating in the European market must comply with a number of legal instruments that collectively define the obligations and principles of reverse logistics. These include:

- the Waste Framework Directive (2008/98/EC), which establishes the waste-management hierarchy and the principle of extended producer responsibility (EPR);
- the Packaging and Packaging Waste Regulation (PPWR) (2025/40, replacing the former Packaging Waste Directive), setting ambitious recycling and reuse targets for packaging materials;
- the WEEE Directive (2012/19/EU) on waste electrical and electronic equipment, requiring producers and distributors to recover valuable materials from used devices and to transfer them to certified processing entities;
- the End-of-Life Vehicles Directive (2000/53/EC), focusing on vehicle dismantling and material recovery; and
- the Landfill Directive (1999/31/EC, amended), which restricts landfilling of recyclable waste and promotes material recovery and energy generation.

Together, these acts constitute the legal foundation for the European Union's transition toward a circular economy, in which manufacturers remain responsible for products throughout their life cycle.

Beyond environmental directives, consumer-protection regulations play a decisive role in shaping reverse logistics operations. Within the European Union, including Poland, consumers benefit from harmonized rights that ensure fair and transparent return processes:

- Right of withdrawal – consumers may withdraw from distance contracts (e.g., online purchases) within 14 days of receiving the product, without providing justification.
- Obligation to process returns – online retailers are legally required to accept and manage returns, with this obligation forming the legal basis for organized return logistics in e-commerce.
- Cross-border returns – the EU's internal market guarantees uniform return rules across member states, whereas outside the EU (e.g., in the United States) such consumer rights may vary or not exist.

These consumer-centric regulations have transformed the logistics of returns from an optional customer-service element into a mandatory business function. Efficient reverse logistics has thus become both a compliance requirement and a competitive differentiator.

Furthermore, specific legal frameworks address distinct waste streams beyond general consumer goods. The WEEE Directive, for instance, imposes obligations on producers and distributors to ensure that certain materials from electronic devices are recovered and processed through authorized facilities. Similar principles apply to batteries, packaging, and end-of-life vehicles. Each of these areas demands a specialized logistics structure capable of handling reverse flows safely and economically.

Business and Consumer Interface

While the regulatory framework defines the responsibilities of producers and retailers, the actual effectiveness of reverse logistics systems depends largely on consumer engagement. The willingness of individuals to return products, separate waste, or participate in take-back programs directly determines the success of such systems. Businesses must therefore design reverse logistics processes that are not only legally compliant but also user-friendly and aligned with customer expectations.

From the corporate perspective, this interaction between legal compliance and consumer behavior creates both challenges and opportunities. Companies that perceive reverse logistics merely as a cost center risk underutilizing its strategic potential. In contrast, firms that integrate consumer-centric return policies—such as free returns, immediate refunds, and accessible collection channels—can build stronger relationships and brand loyalty, turning compliance into competitive advantage.

The integration of reverse logistics into corporate sustainability strategies thus serves a dual purpose: it ensures conformity with environmental and consumer-protection laws while simultaneously enhancing organizational performance and market positioning. Firms that succeed in this integration often report improved efficiency in material flows, better inventory control, and measurable reputational benefits.

Research Context: The Case of the Wielkopolska Voivodeship

Given the multifaceted importance of reverse logistics, the authors undertook a scientific study aimed at exploring both its popularity and perceived significance among working-age consumers in the Wielkopolska Voivodeship (Greater Poland region). The research sought to determine how frequently consumers make use of reverse logistics mechanisms—such as returning or exchanging goods, requesting cash or bank-transfer refunds instead of gift cards, or participating in recycling programs—and which of these mechanisms are considered the most important in everyday life.

The choice of Wielkopolska as the research area was not incidental. It is one of Poland's largest and most economically dynamic regions, covering nearly 30 000 km² and inhabited by approximately 3.5 million people. The capital city, Poznań, functions as a key academic, industrial, and logistics hub situated along the A2 motorway connecting Warsaw and Berlin. The region's economy combines strong agricultural traditions with advanced manufacturing and service sectors, including food processing, automotive, machinery, and logistics industries.

According to *Warehouse Market Wielkopolska Q1 2025* (<https://content.knightfrank.com/research/2660/documents/en/warehouse-market-wielkopolska-q1-2025-12266.pdf>), the region hosts approximately 3.6 million m² of modern warehouse space, accounting for around 10 percent of Poland's total stock, with major logistics centers located in Swarzędz, Tarnowo Podgórne, Gądko, and Komorniki. This concentration of logistics infrastructure, combined with high consumer density and diversified industry, makes Wielkopolska an ideal location for studying how reverse logistics is perceived and practiced by consumers in a mature regional economy.

Moreover, Wielkopolska's position as a testing ground for innovation and industrial policy further strengthens the relevance of the study. The region's enterprises are increasingly involved in pilot projects related to waste reduction, digitalization of logistics, and sustainability certification. These developments provide a real-world context for understanding how theoretical mechanisms of reverse logistics translate into daily consumer decisions and corporate practices.

Research Rationale

The study presented in this article aims to contribute empirical evidence to the ongoing discussion on the integration of reverse logistics mechanisms into business and consumer practices. It addresses both the regulatory drivers and the behavioral determinants that influence the adoption of reverse logistics. The research is grounded in the recognition that the success of circular and sustainable systems depends not solely on technological or legislative factors but also on the active participation of end users.

For businesses, this implies that reverse logistics should be understood not merely as an obligation arising from environmental policy but as a strategic lever for sustainable value creation. For policymakers, the findings may provide insight into how legal instruments and incentives could be refined to promote greater consumer

engagement in return, repair, and recycling processes.

In summary, the literature and the evolving legal environment converge on one point: reverse logistics represents the operational core of circular economy implementation. It connects environmental objectives with economic efficiency, bridging the gap between regulatory compliance and consumer expectations. Understanding its mechanisms, drivers, and perceived importance at the consumer level—particularly in economically significant regions such as Wielkopolska—offers valuable guidance for both practitioners and researchers seeking to align competitiveness with sustainability.

Reverse Logistics

In the face of growing global pressure to reduce the consumption of natural resources and limit pollution, the concept of the Circular Economy (CE) has become a fundamental pillar of contemporary sustainable development strategies (Kirchherr et. al. 2023; Hossain et. al, 2024).

According to the Scopus database, a total of 13,386 scientific documents related to reverse logistics have been published to date, showing a steady growth in academic interest during the last five years (Fig. 1). This increase confirms the growing recognition of reverse logistics as a critical component of sustainable supply chain management and circular economy research.

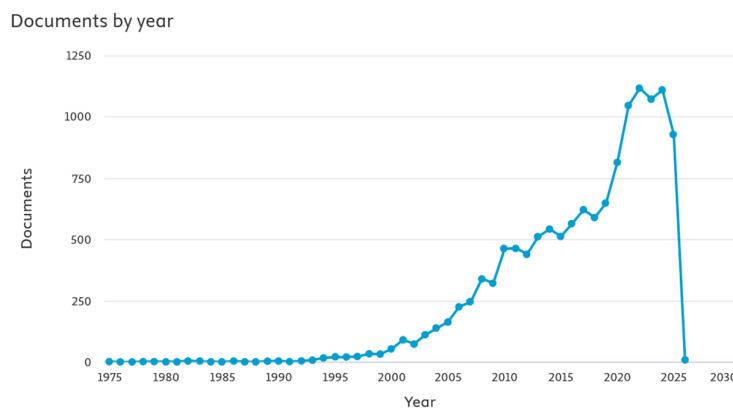


Fig. 1. Trends in Scientific Publications on Reverse Logistics (1975-2025)

Source: <https://www.scopus.com> (1.10.2025)

The latest trends in research on reverse logistics include sustainability and environmental impact, specifically focusing on reducing environmental damage and promoting sustainable practices within supply chains (Zhang et. al, 2023; Salas-Navarro et al. 2024). This includes the integration of reverse logistics with circular economy principles (Mohamed et. al. 2024; Abdelaziz and Munawaroh, 2024; He, et. al., 2024) and closed-loop supply chains concept, emphasizing the importance of recycling, refurbishing, and reusing products to minimize waste (Abdelaziz and Munawaroh, 2024; He, et. al., 2024). Another research topic is implementation of the latest technologies, including Artificial Intelligence (AI), blockchain, and Internet of Things (IoT) that are used to optimize RL processes, improve efficiency, and reduce costs (Ravindran et. al., 2024; Mukherjee et al., 2024). These technologies help in better tracking, managing returns, and enhancing overall supply chain transparency. Transportation technologies are also analyzed, specifically in the context of electric vehicles (EVs) and batteries, focusing on the challenges and opportunities in recycling and reusing batteries (He, et. al., 2024; Nugraha and Sutopo, 2023; Joachimsthaler and Jarmer, 2024).

In academic and policy discourse, more than 200 definitions of the circular economy can be found, reflecting its interdisciplinary and evolving nature. One of the most frequently cited definitions, proposed by J. M. Cullen (Cullen, 2017; Kulczycka, 2019), states that “a circular economy is an economy that is restorative and regenerative by design and aims to keep products, components, and materials at their highest utility and value at all times.” The circular economy emphasizes the efficient use of resources across all stages of a product’s life cycle—from design and raw material acquisition to manufacturing, consumption, waste collection, and reprocessing. Its essence lies in decoupling economic growth from resource depletion and environmental degradation, thereby closing material loops and minimizing losses. Within this framework, three key strategies enable the closure of material and product loops: re-use, remanufacture, and recycle. Each serves a specific purpose, yet together they form a complementary hierarchy of sustainable resource management. Re-use refers

to the repeated use of products or components without significant modification—for example, returning bottles, reusing clothing, or reselling electronic equipment (European Commission Circular Economy Action Plan, 2018; Moss et al., 2022; Klooster et al., 2024). This approach extends the life of products, reduces waste generation, and lowers carbon footprints. However, it faces challenges such as transportation costs, standardization of reusable goods, and quality assurance. Remanufacture involves industrial processes that restore used products to “as-new” condition, typically including disassembly, cleaning, replacement of components, and reassembly (Paul, Eickholt et al., 2024; Paul et al., 2024; Liu, 2024). This strategy enables the recovery of added value and functionality while reducing raw material and energy consumption by up to 80–90% (Sundin and Lee, 2012). Yet, it also encounters barriers related to the variability of returned products, technological complexity, and limited consumer acceptance of remanufactured goods. Recycle refers to processing waste into secondary raw materials that can be reintroduced into production (Pilapitiya and Ratnayak, 2024; NIST, 2024). Recycling helps recover valuable resources and reduces the pressure on landfills, but the processes are often costly and energy-intensive. Moreover, recycling requires well-developed collection infrastructure and effective sorting systems to ensure material quality and economic viability. Although these three strategies are often used interchangeably, they differ in scope, environmental outcomes, and implementation challenges. Importantly, they are not competitive but complementary within the circular economy hierarchy. The generally accepted priority sequence is: first, to promote re-use, then remanufacture, and finally recycle, as a last resort when reuse or remanufacture are no longer feasible. Each of these circular strategies offers significant environmental and economic benefits but also presents specific implementation barriers. The literature highlights that future research and practical actions should focus on developing efficient return and reverse logistics systems to support material recovery, creating standardized procedures for remanufacturing that guarantee quality and traceability, introducing innovative recycling technologies that enable upcycling rather than downcycling, and strengthening regulatory support, consumer education, and business incentives for circular transition (Hossain et al., 2024; Paul et al., 2024; Liu et al., 2024). Reverse logistics constitutes the operational backbone of circular economy implementation. Without effective reverse logistics, circular systems would remain theoretical, as there would be no organized means of collecting, transporting, and processing used products or materials. Reverse logistics enables the physical and informational flow of goods back through the supply chain—allowing reuse, remanufacture, and recycling to occur on an industrial scale. In practice, it transforms sustainability concepts into measurable actions by ensuring that resources are recovered efficiently and reintroduced into production cycles, thus closing the loop between consumption and regeneration. In this sense, reverse logistics is not merely a supportive function but a critical enabler of circularity, bridging the gap between consumer participation, corporate responsibility, and environmental policy. Its effectiveness determines whether the ideals of the circular economy can be realized in practice.



Fig. 2. Reverse logistics system

Source: (<https://www.newcastlesys.com/blog/the-importance-of-reverse-logistics-in-your-supply-chain>)

A reverse logistics system is a process that manages the flow of goods from their point of destination back to the seller or manufacturer for purposes such as returns, repairs, recycling, or disposal. It constitutes a key element of supply chain management, encompassing activities such as collection, inspection, sorting, and processing of returned products to recover their value or ensure proper disposal. The dynamic growth of e-commerce has

further increased the importance of efficient reverse logistics systems for companies, as consumers expect fast, transparent, and environmentally responsible return procedures (<https://www.newcastlesys.com/blog/the-importance-of-reverse-logistics-in-your-supply-chain>).

The significance of reverse logistics can be summarized through several key dimensions.

- Customer satisfaction: A smooth and reliable return process enhances customer trust and loyalty, becoming a crucial factor in maintaining long-term relationships and brand reputation.
- Profitability: Recovering value from returned goods through repair, refurbishment, or resale can reduce operational costs and open new revenue streams.
- Sustainability: Reverse logistics contributes directly to environmental objectives by enabling proper waste management, recycling, and resource recovery, thereby supporting the transition toward a circular economy.
- Waste reduction: By maximizing product and material value, reverse logistics minimizes the volume of waste destined for landfills and mitigates the financial and ecological costs of disposal.

In essence, reverse logistics transforms the traditionally linear supply chain into a closed-loop system, integrating economic efficiency with environmental responsibility. Its effective implementation allows businesses to align with sustainability goals, strengthen competitiveness, and respond to the growing expectations of both regulators and consumers.

The concept of reverse logistics has yet to be clearly defined in the literature, leading to various terms being used interchangeably: recirculation logistics, recovery logistics, green logistics, disposal logistics, and reverse logistics. One of the key drivers for the development of reverse logistics is the introduction of stringent legal regulations, which impose responsibility on businesses for the products they manufacture, even during the final stage of their life cycle. Another significant factor is the growing consumer awareness, as more and more consumers prefer to purchase goods that can be reused or recycled (Lysenko-Ryba, 2015, pp. 193-203).

Reverse logistics (also known as recovery logistics) includes all processes related to returning a product to the seller or manufacturer for the purpose of recovering costs or proper disposal. In such cases, the product moves along the supply chain in the opposite direction than usual.

Wang et al. (Wang et al., 2021) concluded that reverse logistics is a key element of a thriving and efficient supply chain, as it strengthens global value chains to promote sustainable supply chain practices. Similarly, U-Dominic et al. (U-Dominic et al., 2021) analyzed that it enhances the competitive advantage for the end consumer and improves customer satisfaction and loyalty. In the literature, the term “take-back” is often used to describe the process of retrieving customer returns and directing them to a recovery location (Bockholt et al., 2020; Ghoreishi et al., 2011; Kusturica et al., 2020).

Moreover, Singh and Ordoñez (Singh J. and Ordoñez, 2016, pp. 342-353) noted that “as the transition to the circular economy (CE) gains momentum, there is a growing emphasis on recirculating products, components, and materials through strategies like reuse and recycling.” As the shift toward a circular economy accelerates, there is increasing focus on reusing products, components, and materials through strategies such as reuse and recycling. In this context, Bhatia et al. (Bhatia et al., 2020) demonstrated that the implementation of reverse logistics has become essential for organizations, which can derive significant benefits from it.

By reorganizing processes, including sales and distribution, companies can achieve substantial improvements in their condition and market position. The changes occurring within companies stem from adopting the so-called process approach, which views the organization as a closely connected system with various interdependencies (Misztal, 2017, pp. 204–206).

The implementation of reverse logistics can result in significant economic benefits, such as cost reductions related to waste and increased profits through the recovery of part or even all of the used materials. Additionally, from an environmental standpoint, companies that employ reverse logistics contribute to reducing the amount of waste in landfills by promoting recycling, disposal, and the reuse of products. Moreover, reverse logistics allows organizations to increase customer satisfaction by providing efficient return services and timely resolution of product-related issues (Jain et al., 2023). Studies further indicate that companies should invest in digital technologies to enhance the efficiency of logistics processes, including reverse logistics mechanisms. Such investments can strengthen the brand’s image in the eyes of potential customers, create positive associations, and directly increase orders, ultimately improving the company’s profitability.

Reverse logistics not only strengthens customer relationships by efficiently managing returns and post-purchase complaints, but it also enhances a company's performance when integrated with core logistics operations. Additionally, investing in employee training and technologies supporting return management can be crucial for the further development and efficiency of reverse logistics within a company (Farooq, 2019, pp. 511-531).

In research on reverse logistics and its performance evaluation, these areas are often treated separately, leading to a lack of a comprehensive perspective and approach to assessing reverse logistics mechanisms. Most studies focus on methods, techniques, and tools for performance evaluation, without considering the broader strategic and operational context. There is a clear need for integrated reverse logistics performance evaluation models that are flexible and adaptable to the specific characteristics of different industries or sectors. Furthermore, the integration of reverse processes with overall business strategy and investments in information technology are essential for achieving sustainability and competitiveness in the market (Voigt et. al., 2019).

Different industries require specific approaches to reverse logistics within their strategies. In the FMCG (Fast-Moving Consumer Goods) sector, implementing reverse logistics mechanisms can improve competitiveness. Consumers recognize the benefits of reverse logistics in their daily lives. Effective reverse logistics strategies can contribute to enhancing the competitiveness of companies in the FMCG sector, delivering both economic and environmental benefits (Makaleng et. al., 2022, pp. 56-78). However, the authors also highlight that to further increase the competitiveness of green supply chains, it is necessary to improve consumer perceptions of the quality of products derived from reverse logistics processes. A study conducted in Serbia showed that the perception of product quality from reverse logistics processes is negative. This indicates that customers are not always convinced of the quality of goods coming from green supply chains. Managers should work on raising consumer awareness of the benefits of reverse logistics and green initiatives, which can directly enhance a company's competitiveness and improve the perception of reverse logistics mechanisms (Aćimović et. al., 2020).

The main performance indicators for reverse logistics include value recovery and return on investment, minimizing energy consumption and optimizing resource utilization (environmental), as well as community complaints and customer health and safety. Evaluating reverse logistics performance from a triple bottom line perspective provides a more sustainable and comprehensive approach to managing logistics operations (Agrawal et. al., 2016, pp. 289-310).

Methodology

The research methodology was designed to achieve the goal set in this article and involved the implementation of several stages. The first stage of the work was a review of the scientific literature. Based on the literature review and secondary research, the impact of reverse logistics on society was presented, as well as the main market requirements related to competition.

The preliminary research focused on examining consumer perspectives, aiming to determine the frequency of using these mechanisms and their importance in everyday life. An analysis and critique of the literature were conducted, the results of which are presented in the first part of this article. The authors developed a research tool—a survey questionnaire consisting of questions about the frequency and importance of selected reverse logistics mechanisms.

The CAWI technique, i.e. Computer-Assisted Web Interview, was selected as the research technique, as it is one of the most popular and fastest-growing research methods. The advantages of CAWI testing are speed, convenience, and low cost. Thanks to CAWI, the survey can be carried out in a relatively short time and reach many respondents. In addition, the advantage of CAWI is the freedom of the respondent to choose the date and pace of completion of the survey. The questionnaire consisted of ten questions, designed on the basis of a literature review and the research objectives outlined in Section 1. Respondents were first asked about their familiarity with the concept of reverse logistics and their understanding of the term, which made it possible to assess general awareness and identify the gap between theoretical knowledge and everyday practice. Subsequent questions focused on the frequency of using specific mechanisms, such as reusable packaging, returning glass bottles, returning damaged goods, or recycling electronic devices. These items were derived from mechanisms most frequently discussed in the literature and observed in consumer markets, with the purpose of capturing actual practices and the relative popularity of different solutions. Further questions were devoted to the perceived importance of reverse logistics mechanisms, measured on a Likert scale, including aspects such as free returns, immediate refund to bank account or cash, the speed of return processing, and the use of IT systems. This allowed the identification of mechanisms and features that are considered most valuable by consumers. At the end of the survey, open-ended questions were included, enabling respondents to share their

own experiences and suggestions related to reverse logistics. These qualitative insights complemented the quantitative results by highlighting unmet needs and emerging expectations. The formulation of the questions was based on insights from previous studies (Lysenko-Ryba, 2015; Farooq et. al., 2019; Makaleng et. al., 2022) and adjusted to the Polish consumer context, ensuring both comparability with international research and relevance to local conditions. Preliminary research covered the Wielkopolskie region (<https://wielkopolska.eu/wielkopolska-region-mainmenuen-181> (1.10.2025)). The time frame for data collection is October 2023 - March 2024, and the responses concerned the time period examined for respondents' opinions. To carry out preliminary research, a survey questionnaire was designed and sent to over 100 random respondents. Over 80 responses were collected, which, based on preliminary research assuming 2,0683,863 inhabitants of Wielkopolskie Voivodeship of working age for a confidence level of 95% and a fraction size of 0.5, results in a maximum error of approximately 10%. This result is sufficient to conduct conclusions at the level of preliminary research from the answers received. The most important from the point of view of research implementation were three research questions (RQ):

RQ1: To what extent are the respondents familiar with the concept of reverse logistics?

RQ2: What are the most popular reverse logistics mechanisms for individual customers?

RQ3: Which of reverse logistics mechanisms are most important to respondents?

The next stage of the research involved analyzing the data obtained from the survey and interpreting it in the context of the conducted study. The final stage was the presentation of the discussion section, based on the results of the data analysis, which included explaining the significance of the findings and their potential implications, as well as conclusions addressing key aspects, limitations, and possible directions for future research.

The next stage of the research work was the analysis of the data obtained in the course of the survey and their interpretation in the context of the research carried out. The last stage was the presentation of the discussion part based on the results of the data analysis, which included an explanation of the importance of the obtained results and their potential implications, as well as inferences covering key aspects, limitations, and further directions of possible research.

Results

The survey directed at respondents consisted of 10 questions, half of which were basic, while the remaining were supplementary. The results obtained from the survey are presented below. The first question aimed to verify respondents' knowledge of the concept of reverse logistics (Fig. 3). Fifty-five respondents (55%) indicated that they were familiar with the concept of reverse logistics, while as many as 36 individuals (45%) stated that they were not familiar with the term.

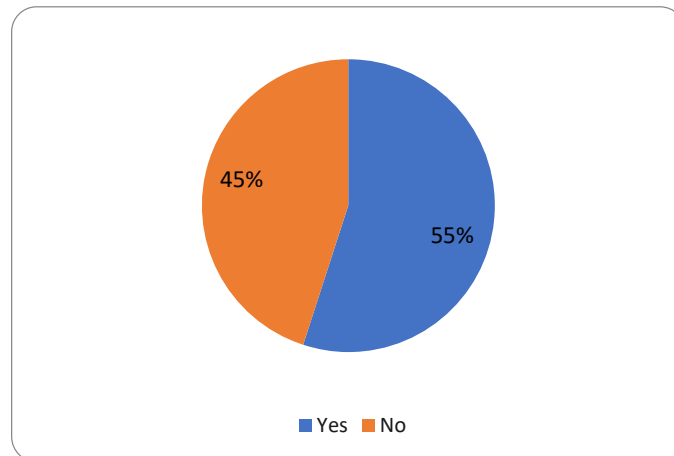


Fig. 3. Knowledge of the concept of reverse logistics declared by respondents

Source: own research

Even though more than half of the respondents (45%) declared that they were unfamiliar with the concept of reverse logistics, all respondents acknowledged using its mechanisms. This indicates that, despite not knowing the formal definition of the concept, they apply these mechanisms in their everyday lives, as illustrated in the chart below (Fig. 4).

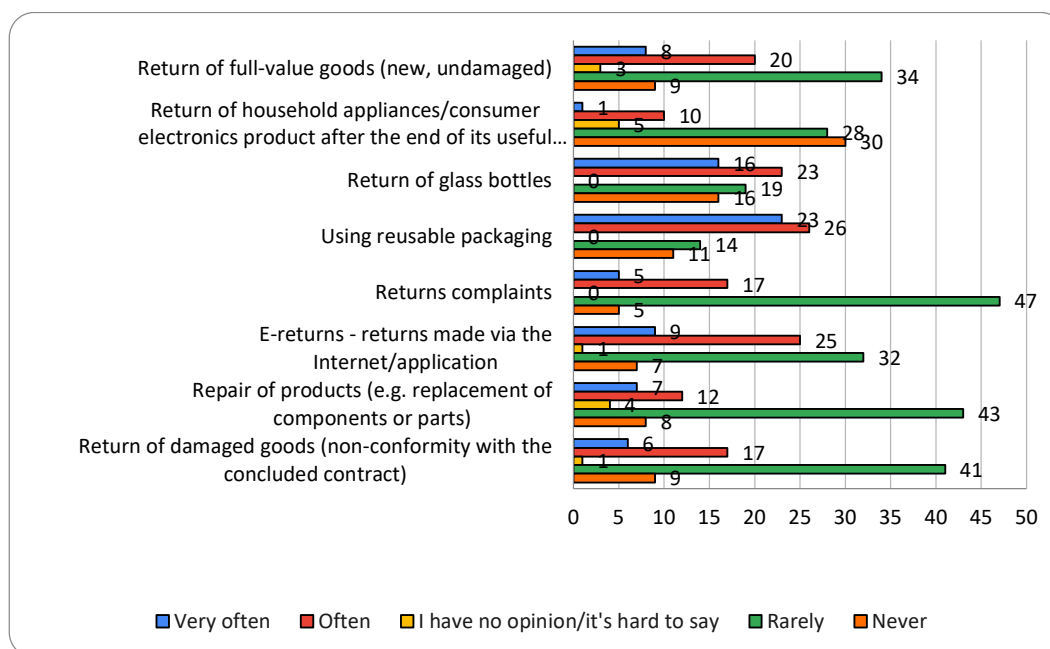


Fig. 4. Frequency of using reverse logistics mechanisms declared by respondents

Source: own research

The Figure 4 presents respondents' answers regarding the frequency of using reverse logistics mechanisms. The most commonly used mechanisms are reusable packaging (26 respondents use it often, and 23 use it very often, which together constitutes 61% of respondents) and the return of glass bottles (23 respondents). An interesting result is that only 1 person uses the return of household appliances and electronics very often, while 30 people stated that they never use returns for household appliances or electronics. It is also noteworthy that 47 respondents indicated that they rarely use return claims, and 43 people rarely repair or return damaged goods (41 respondents, accounting for 51% of the surveyed group).

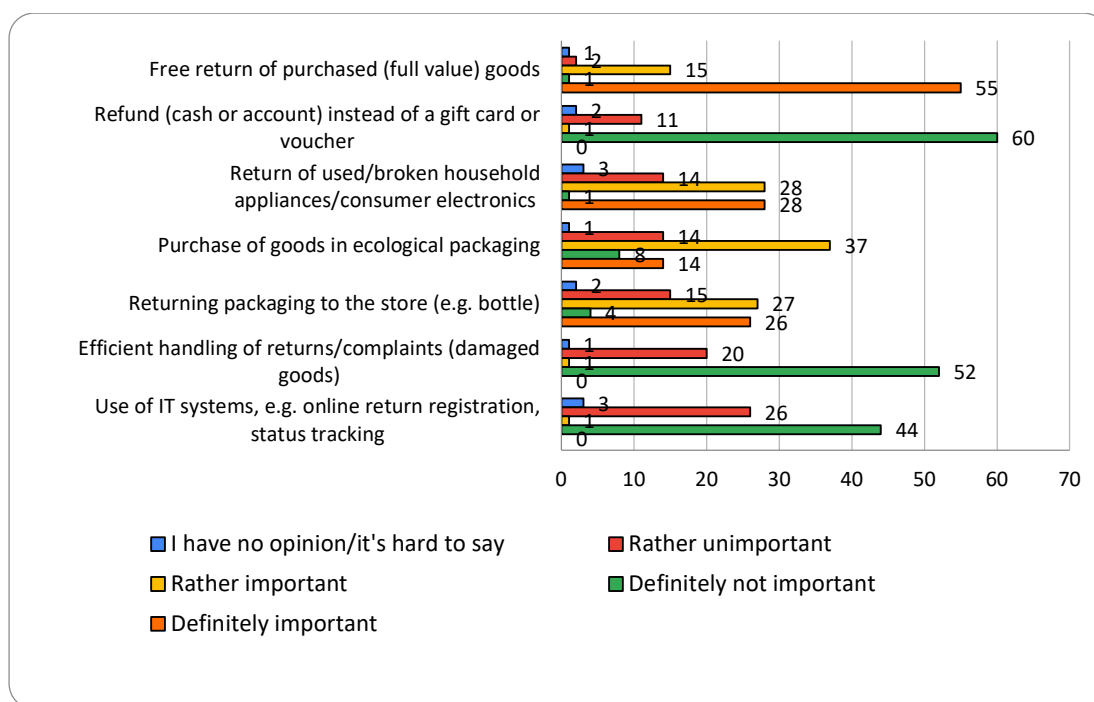


Fig. 5. The importance of reverse logistics mechanisms declared by respondents

Source: own research

In the next question, respondents were asked to indicate the importance of reverse logistics mechanisms. Free returns of purchased products were identified as a very important factor by respondents (55 out of 80 people, accounting for 68% of the respondents). On the other hand, efficient return processing and the use of IT systems were deemed either definitely unimportant or rather unimportant.

An analysis of the data allows us to draw conclusions about the significance of logistics mechanisms for customers. These insights are crucial for businesses, as they can implement and improve these mechanisms, which would help them remain competitive in the market and attract new customers. Additionally, the study of the popularity and importance of reverse logistics mechanisms among consumers yielded interesting results. Although almost half of the respondents (45%) stated that they were unfamiliar with the term "reverse logistics," all respondents acknowledged using its mechanisms. This suggests that, although respondents may not know the formal definition, they employ these mechanisms in their daily lives and are able to assess their importance. It is often the case that we apply certain practices without knowing their exact terminology. The results should be interpreted as a positive foundation for further efforts toward the development of reverse logistics.

Additionally, respondents were asked to provide open-ended comments regarding reverse logistics. The qualitative feedback complements the quantitative findings and highlights consumer perceptions and expectations. Several themes emerged from the answers. Firstly, respondents emphasized that the right to return should primarily serve as a consumer protection mechanism, enabling the return of defective or unsuitable products with a corresponding refund. Secondly, participants observed that companies increasingly compete in the speed and convenience of their reverse logistics processes, with many promoting eco-friendly solutions. According to the respondents, rapid and seamless return options—such as courier pick-up, in-store returns, or parcel locker services—are becoming standard practice across most businesses. Thirdly, reverse logistics was perceived as a factor that differentiates companies from their competitors and strengthens their market position. Finally, respondents expressed expectations for further infrastructure development, such as the broader availability of plastic recycling machines and systems for collecting packaging from larger household appliances, which would reduce the need to dispose of such items independently.

This qualitative evidence reinforces the quantitative results, demonstrating that consumers not only value free and immediate returns but also associate reverse logistics with corporate responsibility, innovation, and competitive advantage. It also reveals growing expectations for more advanced solutions in waste collection and recycling, indicating potential directions for companies and policy-makers to further enhance reverse logistics systems.

Conclusions

The research presented in this article aimed to answer three research questions related to the familiarity, usage, and perceived importance of reverse logistics mechanisms among working-age consumers in the Wielkopolska Voivodeship.

RQ1: To what extent are respondents familiar with the concept of reverse logistics?

The results showed that almost half of the respondents were not familiar with the formal definition of reverse logistics. However, all respondents declared that they use its mechanisms in practice. This confirms the existence of a terminology-practice gap: consumers apply reverse logistics solutions in everyday life without recognizing them under this name. From a managerial perspective, this highlights the need to communicate the benefits of reverse logistics in a simple and consumer-oriented way, using terminology that is understandable to the general public.

RQ2: What are the most popular reverse logistics mechanisms for individual customers?

The most frequently used mechanisms were reusable packaging and the return of glass bottles, both widely adopted by consumers. In contrast, mechanisms related to household appliances and electronics were used least often. This suggests that in high-value categories consumers face barriers such as limited convenience, lack of infrastructure, or insufficient incentives. Similar conclusions were drawn in international research, which highlighted lower consumer willingness to return electronic devices or large equipment compared to everyday goods (Aćimović et. al., 2020).

RQ3: Which reverse logistics mechanisms are most important to respondents?

Respondents emphasized the importance of free returns combined with immediate refunds to a bank account or in cash, rather than gift cards. Such findings confirm that convenience and financial transparency are key determinants of consumer satisfaction. By contrast, aspects such as IT system efficiency or internal processing speed, although essential for companies, were not identified as priorities by consumers. This aligns with other studies stressing that from a customer perspective, simplicity and refund speed have the strongest influence on satisfaction and loyalty (Farooq et. al., 2019).

Comparison with the literature

Our results are consistent with previous findings that reverse logistics strengthens competitiveness in the FMCG sector (Makaleng et. al., 2022). At the same time, skepticism about the quality of products originating from reverse logistics processes – identified in Serbian studies (Aćimović et. al., 2020) – corresponds to the low popularity of returning electronics and appliances in our sample. Furthermore, the demand for convenience expressed by consumers in this study supports conclusions in the literature linking reverse logistics to customer loyalty when return processes are designed to be fast and transparent (Farooq et. al., 2019). Calls for integrated models of reverse logistics evaluation (Voigt et. al., 2019) and for the wider use of digital tools (Jain et. al., 2023) also align with our observation that consumer expectations and company requirements are not always the same.

Practical implications

The findings suggest several directions for companies:

- simplify return procedures and ensure fast, cost-free refunds;
- emphasize the availability and ease of return mechanisms in consumer communication;
- develop dedicated solutions for categories with low return rates, especially electronics and appliances (e.g., pick-up services, repair programs, or vouchers);
- provide transparent information and guarantees regarding the quality of refurbished or recycled products to reduce consumer skepticism (Aćimović et. al., 2020);
- monitor reverse logistics effectiveness not only through financial indicators but also environmental and social outcomes, in line with the triple bottom line perspective (Agrawal et. al., 2016).

Raising awareness and consumer knowledge

An important conclusion from the study is the need to strengthen consumer knowledge about reverse logistics. Simple measures such as including clear instructions on packaging, creating visible collection points, and running local awareness campaigns could close the gap between usage and understanding. Additionally, incentive-based solutions – e.g., discounts or loyalty points for returns – could encourage greater participation. Making environmental benefits measurable and visible (e.g., through reporting waste diverted or resources saved) would also help increase consumer trust.

Limitations of the study

The research was preliminary in nature, with a relatively small sample and limited to the Wielkopolska Voivodeship. The survey was based on self-reported data, which may be influenced by recall or social desirability bias. Moreover, only selected mechanisms of reverse logistics were examined, without a detailed comparison across industries or inclusion of the company perspective.

Directions for future research

Further studies should expand the sample to a national or international scale, enabling comparisons across regions and countries. Research should also examine demographic and behavioral differences among consumers, as well as combine consumer perspectives with company-side operational data. It would also be valuable to test interventions aimed at increasing awareness and usage of reverse logistics in high-barrier categories such as electronics. Finally, future work should contribute to the development of integrated models for evaluating reverse logistics that combine economic, environmental, and social indicators with consumer-centered measures (Voigt et. al., 2019; Agrawal et. al., 2016).

Final Remark

The results confirm that consumers already use reverse logistics mechanisms, often unconsciously, and that these mechanisms influence purchasing decisions and competitiveness. Companies that design return systems to be convenient, transparent, and consumer-friendly will not only improve customer satisfaction and market position but also contribute to sustainable development goals (Farooq et. al., 2019; Makaleng et. al., 2022).

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used the support of the Scopus database literature search, translation, and editing was checked with Generative AI and Writefull tools. After using this tools, the authors reviewed and edited the content as needed and take(s) full responsibility for the content of the publication. Research results are original.

Funding: This research was funded by the Poznan University of Technology, Faculty of Engineering Management [project No. 0812/SBAD/4244].

Institutional Review Board Statement: The approval of ethical commission was not required as the research did not include any questions concerning private or health issues, religion or political opinions. Respondents were informed about the scope of the research, the use of the results, and they could quit the survey at any moment without consequences.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

References

- Abdelaziz, S. and Munawaroh, M., (2024), Mitigating Supply Chain Vulnerabilities: A Bibliometric Analysis of Sustainable Logistics for Resilience and Risk Management with Perspectives on the Automotive Industry. *IJASTECH*. December; 8(4), pp. 544-588.
- Aćimović S., Mijušković V. and Rajić V., (2020), The impact of reverse logistics onto green supply chain competitiveness: Evidence from Serbian consumers, *International Journal of Retail & Distribution Management*, pp. 1003-1021.
- Agrawal S., Singh R.K. and Murtaza Q., (2016), Triple bottom line performance evaluation of reverse logistics, *Competitiveness Review*, 2016, pp. 289-310.
- Bhatia M.S., Jakhar S. K, Mangla S. K. and Gangwani K. K., (2020), Critical factors to environment management in a closed loop supply chain. *J. Clean. Prod.*, 255, 120239.
- Bockholt, M.T., Kristensen, J.H., Colli, M., Jensen, P.M. and Waehrens, B.V., (2020), Exploring factors affecting the financial performance of end-of-life take-back program in a discrete manufacturing context *J. Clean. Prod.*, 258, Article 120916.
- Cullen, J. M. (2017), Circular Economy: Theoretical Benchmark or Perpetual Motion Machine? *Journal of Industrial Ecology*, 21(3).
- European Commission Circular Economy Action Plan. Brussels, 2018.
- Farooq, O., Farooq, M. and Reynaud, E., (2019), Does Employees' Participation in Decision Making Increase the level of Corporate Social and Environmental Sustainability? An Investigation in South Asia, *Sustainability* 11(2), 511.
- Ghoreishi, N., Jakiela, M.J. and, Nekouzadeh, A., A., (2011), cost model for optimizing the take back phase of used product recovery. *J. Remanufacturing*, 1.
- He, M., Li, Q. Wu, X. and Han, X., (2024), A novel multi-level reverse logistics network design optimization model for waste batteries considering facility technology types, *Journal of Cleaner Production*, Volume 467.
- Hossain, M., Park, S., Suchen, N. and Pansera, M., (2024), Circular economy: A review of review articles, *Business Strategy and the Environment*, 33(7), 7077-7099.
- <https://content.knightfrank.com/research/2660/documents/en/warehouse-market-wielkopolska-q1-2025-12266.pdf>. (25.08.2025).
- <https://www.scopus.com> (1.10.2025).
- <https://wielkopolska.eu/wielkopolska-region-mainmenuen-181> (1.10.2025).
- Jain, K., Makholia, D, Mishra, R., Kumar, A., Kashyap, R.C., Bhagat, N. and Padiyar, S. V. S., (2023), Review on green inventory model and reverse logistic, *Eur. Chem. Bull*, 12 (Special Issue 10), pp. 4254 –

- Joachimsthaler, C. and Jarmer, J. P., (2024), Modeling the Environmental Impact of Reverse Logistics for Traction Batteries," *Electronics Goes Green 2024+ (EGG)*, Berlin, Germany, pp. 1-8.
- Kirchherr, J., Yang, N-H. N., Schulze-Spüntrup, F., Heerink, M. J., Hartley, K., (2023), Conceptualizing the Circular Economy (Revisited): An Analysis of 221 Definitions". *Resources Conservation & Recycling*, Volume 194.
- Klooster, A., Bellostas, B. C., Henry M. and Shen L., (2024), Do we Save the Environment by Buying Second-Hand Clothes? The Environmental Impacts of Second-Hand Textile Fashion and the Influence of Consumer Choices, *Journal of Circular Economy*, 2(3).
- Kulczycka, J., (2019), Gospodarka o obiegu zamkniętym w polityce i badaniach naukowych, IGSMiE PAN, Kraków.
- Kusturica, M.P., Golocorbin-kon, S., Ostojic T., Kresoja, M., Milovic, M., Horvat, O., Dugandzija, T., Davidovac, N., Vasic, A., Tomas, A., (2020), Consumer willingness to pay for a pharmaceutical disposal program in Serbia: a double hurdle modeling approach'. *Waste Manag.*, 104, pp. 246-253.
- Liu, C., Yang, Y. and Liu X., (2024), A holistic sustainability framework for remanufacturing under uncertainty. *Journal of Manufacturing Systems*, Volume 76, pp. 540-552.
- Lysenko-Ryba, K., (2015), Logistyka zwrotna jako źródło korzyści konkurencyjnych, *Studia Ekonomiczne. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach* Nr 249, pp. 193-203.
- Makaleng, M. S., (2022), Hove-Sibanda P., Reverse Logistics Strategies and Their Effect on the Competitiveness of Fast-Moving Consumer Goods Firms in South Africa, *Logistics*, 56-78.
- Misztal, A., (2017), Procesy logistyczne a zrównoważony rozwój przedsiębiorstwa, *Zeszyty Naukowe Politechniki Poznańskiej. Organizacja i Zarządzanie*, 75, pp. 201–212 <https://zeszyty.fem.put.poznan.pl/pdf-126070-54011?filename=Procesy%20logistyczne%20a.pdf>.
- Mohamed, M. A., Farah, M. A., Jama, L. A. Mohamud, I. H., Mohamud, I. H., Siyad, M. A. and Malin, I. M., (2024), A decade of Reverse Logistics Research (2013-2023): A Comprehensive Bibliometric Analysis of Trends, Influences and Global Engagement, *Journal of Logistics, Informatics and Service Science*.
- Moss, E., Gerken, K., (2022), Youngblood K., Jambeck J. R., Global landscape analysis of reuse and refill solutions. *Frontiers in Sustainability*, Volume 3, id. 1006702.
- Mukherjee, S., Nagariya, R., Mathiyazhagan, K., Baral, M. M., Pavithra, M., R. and Appolloni, A., (2024), Artificial intelligence-based reverse logistics for improving circular economy performance: a developing country perspective. *The International Journal of Logistics Management* 28 October 2024; 35 (6), 1779–1806.
- NIST, (2024), The U. S. Plastics Recycling Economy Report, <https://nvlpubs.nist.gov/nistpubs/ams/NIST.AMS.100-64.pdf>.
- Nugraha, I. and Sutopo, W., (2024), Bibliometric Analysis of Research Trends in Reverse Logistics in Indonesia in the Electric Vehicle Field. In: Kurniawan, D., Nor, F.M. (eds) *Advances in Manufacturing Processes and Smart Manufacturing Systems. GCMM 2023. Lecture Notes in Networks and Systems*, Springer, vol 1214. Cham.
- Paul, M. and Eickholt D., (2024), Reinhart G., Framework for adaptable remanufacturing. *Production & Manufacturing Research* 12(1).
- Paul, M., Qian-Chu Gong, S., Löffler J. and Reinhart G., (2024), Enhancing product design for remanufacturing: guidelines and their implementation in integrated remanufacturing systems, *Production & Manufacturing Research*, 12 (1).
- Pilapitiya, P. G. C. N. T. and, Ratnayake, A., A., (2024), The world of plastic waste: A review. *Cleaner Materials*, Volume 11.
- Ravindran, D., Raja, S., Rajapriya, M., Lumina Juli,e R. and Tamilselvan, P., (2024), Optimizing Supply Chain Through Risk Analysis: A Path to Enhanced Efficiency and Resilience. In: El Khoury, R. (eds) *Technology-Driven Business Innovation. Studies in Systems, Decision and Control*, Springer, vol 223. Cham.
- Salas-Navarro, K., Castro-García, L., (2024), Assan-Barrios K.; Vergara-Bujato K.; Zamora-Musa R. Reverse Logistics and Sustainability: A Bibliometric Analysis. *Sustainability*, 16, 5279.
- Singh, J'. and Ordoñez, I., (2016), Resource recovery from post-consumer waste: important lessons for the upcoming circular economy'. *J. Clean. Prod.*, 134, pp. 342-353.
- Sundin, E. and Lee, H. M., (2012), In what way is remanufacturing good for the environment? CIRP, In: Matsumoto, M., Umeda, Y., Masui, K., Fukushima, S. (eds) *Design for Innovative Value Towards a Sustainable Society*. Springer.
- U-Dominic, C.M., Orji, I.J. and Okwu, M., (2021), Analyzing the Barriers to Reverse Logistics, (RL) Implementation: A Hybrid Model Based on IF-DEMATEL-EDAS'. *Sustainability*, 13, 10876.
- Voigt, D., Filho, N. C., Macedo, M. A., Braga, T. G. and Rocha, R. U. G., (2019), Thais Guerra Braga i

Rodrigo Ulisses Garbin da Rocha, Performance Evaluation of Reverse Logistics: Opportunities for Future Research, *Sustainability*, 2019, 5291-5310.

- Wang, C.N., Dang T. and Nguyen N., (2021), Outsourcing reverse logistics for e-commerce retailers: A two-stage fuzzy optimization approach'. *Axioms*, 10 (1) 34.
- Zhang, X., Yu, J., Yan, W., Wang, Y. and Subramanian N., (2023), A Comprehensive Review of Reverse Logistics in the Automotive Industry," in *IEEE Access*, vol. 11, 47112-47128.