






Circular Economy and Sustainable Packaging in the Malaysian Courier Service Industry: Transforming Supply Chains for a Greener Future



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ABSTRACT

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Malaysia's courier service industry plays a critical role in supporting the rapid expansion of e-commerce and last-mile logistics. However, this growth has intensified packaging waste generation, particularly from single-use and difficult-to-recycle materials. According to national statistics, Malaysia generates approximately 38,000–40,000 tonnes of municipal solid waste per day, with plastic packaging constituting a substantial proportion of urban waste streams (Department of Statistics Malaysia (DOSM), 2023; Solid Waste and Public Cleansing Management Corporation (SWCorp), 2022). Packaging for e-commerce and express delivery services has emerged as a significant contributor to this waste profile. In response, circular economy (CE) principles and sustainable packaging solutions have gained increasing attention as mechanisms to reduce environmental impact while maintaining operational efficiency in logistics. This study examines the adoption of sustainable packaging and CE practices within Malaysia's courier service industry using a mixed-methods research design. Quantitative data were collected through a structured survey administered to logistics firms and last-mile delivery operators across major urban regions, while qualitative insights were obtained through semi-structured interviews with industry practitioners. The findings indicate that although awareness of sustainable packaging is increasing, adoption remains uneven and is strongly influenced by firm size, cost considerations, infrastructure availability, and regulatory clarity. Inferential analysis suggests that larger firms and those with higher environmental awareness are significantly more likely to adopt sustainable packaging solutions. The study contributes empirically by identifying and ranking adoption barriers, demonstrating heterogeneity across firm sizes, and translating CE principles into an actionable implementation framework tailored to the Malaysian courier sector. The findings provide policy-relevant insights for regulators and practical guidance for logistics firms seeking to transition toward environmentally sustainable and circular packaging systems.

1. INTRODUCTION

1.1 Background

With a rise in e-commerce worldwide, the whole picture of logistics and courier services has been reshaped, causing a number of opportunities and challenges to arise through supply chains, and with increasing consumer demands, online presence, and the emerging middle classes, the courier industry has been experiencing a growth of more than 10% in the last ten years. The Malaysian courier service industry is an essential component of the logistics sector, driving economic growth, particularly with the rapid rise of e-commerce. As e-commerce continues to thrive, demand for timely deliveries has skyrocketed, driving a surge in packaging waste. A significant portion of this waste consists of non-recyclable, non-biodegradable materials, such as plastic [1]. The environmental impact of this waste has prompted growing

calls for sustainable packaging practices.

Although packaging is a necessity for ensuring that some goods remain safe without damage and helps in building brand value [2], the adverse effects of the current packaging usage status of a huge amount of packaging material have reached dangerous heights that cannot be ignored. Here, applying the circular economy (CE) concept to the courier service industry, especially the packaging segment, has become a necessity and a driver of sustainable development.

Sustainable packaging, grounded in CE principles, offers a promising solution to reduce waste and optimize resource use in the courier service sector. The CE focuses on the principles of reducing waste, reusing materials, and recycling packaging [3], which stand in stark contrast to the traditional linear model of "take, make, dispose." This approach can reduce environmental harm, minimize reliance on virgin materials, and lower operational costs by promoting resource efficiency. In Malaysia's courier service sector, integrating CE principles

could lead to reduced packaging waste, lower carbon footprints, and enhanced long-term business profitability.

The problem of packaging of the Malaysian courier services is a multi-dimensional one. At the industry level, low-cost, standardized packaging forms (e.g., bubble wrap, polyethylene bags, and polystyrene fillers) are commonly used by courier companies because they are cheaper and readily available. Smaller players in the logistics business and small and medium-sized enterprises (SMEs), which occupy too large a share of the last-mile delivery sector, are either incapable or unwilling to invest in sustainable packaging materials. On the consumer end, the pressure to provide a cheap, quick mode of delivering goods usually overpowers environmental concerns, and there is a lack of market pressure on firms to adopt greener packaging. The system is built on a spiral of unsustainable processes powered by packaging waste, which is regularly disposed of in landfills, burned in incinerator chambers, or dumped into the sea because of inefficient sorting, collection, and recycling facilities. Moreover, in Malaysia's current policy environment, although there are indications of policy development through strategies such as the Malaysia Plastic Sustainability Roadmap 2021–2030 and the Extended Producer Responsibility (EPR) system, there is yet no policy specific to the courier or e-commerce packaging sector.

Amid the challenges, opportunities are also opening, signaling a possible transition. Increased concern among urban consumers about the environment, pressure from international trading partners, and the subsequent increase in the cost of virgin plastic materials are pushing logistics providers to seek alternatives. Also, the recent development of technologies, such as QR-coded returns packaging, blockchain-based tracking systems, and biodegradable composites made from agricultural by-products, opens exciting horizons.

This shift to sustainable packaging in the courier industry is especially important to consider, as the industry touches nearly every sector of the economy, including retail, electronics, food, and pharmaceuticals. The high visibility and traceability of packaging waste generated by courier services make it a magnet for public attention and political intervention. Finally, sustainable packaging also supports national goals of reducing greenhouse gas emissions, promoting green employment, and ensuring resource security through the valorization of waste. This transition establishes several long-term advantages to logistics companies, such as brand differentiation [4], process efficiency due to materials optimization, a decrease in the usage of raw materials that reflect the company's sales, and the availability of financing tools like green financing, etc. Nevertheless, achieving these gains needs to be a system change built on research-based policy interventions, stakeholders, and multi-scalar innovation, through the value chain of packaging.

By using these opportunities and difficulties, this paper explores how CE principles can be adopted within the Malaysian courier service industry, particularly focusing on the use of sustainable packaging. The worldwide increase in e-commerce has significantly altered the logistics and courier service sector, generating both new opportunities and challenges throughout supply chains. By investigating current practices, identifying barriers, and assessing the potential for transformation, this study seeks to outline a roadmap for sustainable development in the sector.

1.2 Problem statement

The onset of e-commerce and online trade in Malaysia has

dramatically transformed consumer behavior and supply chain logistics. As more Malaysians flock to online shopping, the number of parcels delivered daily by courier providers has increased exponentially. Although this growth has led to beneficial economic activity, employment opportunities, and the development of logistics infrastructure, it has also paved the way for a crucial but often unnoticed environmental dilemma: excessive and unsustainable packaging waste. Packaging, once considered a rather marginal factor in the supply chain, is now a major source of the growing solid waste challenge in Malaysia's urban regions. The typical materials used for the distribution of goods include single-use plastic envelopes, multilayered mailers, bubble wrap, inserts, and plastic tape, among others, and most of them are unrecyclable or simply unrecyclable within municipal systems. Consequently, most of these materials are left in landfills or spill into rivers and oceans, creating significant ecological hazards [5, 6].

Despite growing awareness of environmental sustainability, the Malaysian courier service industry continues to rely heavily on unsustainable packaging materials. The widespread use of single-use plastic and non-recyclable packaging contributes significantly to the country's mounting waste problem. According to recent studies, over 80% of packaging used by courier services in Malaysia is non-recyclable [7]. While larger companies are starting to pilot sustainable packaging initiatives, adoption across the sector remains limited, especially among smaller firms, due to various barriers, including high costs, limited infrastructure, and insufficient consumer demand for eco-friendly alternatives.

Given the urgency of climate change, resource depletion, and environmental degradation, the failure to transition to sustainable packaging in the courier sector presents a strategic risk for Malaysia. It undermines the nation's broader sustainability goals, including those outlined in the 12th Malaysia Plan, the National Circular Economy Roadmap, and its commitments to the United Nations Sustainable Development Goals (SDGs).

Moreover, it puts Malaysian logistics firms at a competitive disadvantage in international markets, where sustainable packaging is increasingly required for trade compliance, consumer acceptance, and brand reputation. For instance, the European Union's forthcoming Packaging and Packaging Waste Regulation (PPWR) and similar green trade regulations could pose market access barriers for Malaysian exporters if local logistics systems fail to align with global standards.

Thus, the problem is not merely technical or operational; it is systemic and strategic. It involves shifting industry norms, reconfiguring value chains, redesigning products, and reshaping consumer expectations. It demands collaborative action across sectors, robust policy interventions, and significant investment in research, innovation, and education. Most importantly, it requires a change in mindset—from viewing packaging as a cost centre to recognizing it as a lever for sustainability, differentiation, and long-term value creation.

The problem at hand is the slow and uneven adoption of CE practices in the Malaysian courier service industry. This research aims to uncover the underlying causes of this slow adoption and propose actionable solutions to facilitate a transition to more sustainable packaging practices within the industry. By focusing on CE principles, the study seeks to highlight the environmental, economic, and social benefits of adopting sustainable packaging and to contribute to a greener future for Malaysia's courier services.

1.3 Research objectives

This study aims to investigate the integration of sustainable packaging and CE principles into Malaysia’s courier service industry. The specific objectives of this research are:

1. To assess the current state of packaging practices in the Malaysian courier service industry, including the materials used and the degree of sustainability in current practices.
2. To explore the drivers and barriers to adopting sustainable packaging solutions, with a focus on the challenges specific to the Malaysian context.
3. To evaluate the environmental and economic benefits of adopting circular economic principles, particularly in reducing waste, minimizing carbon emissions, and optimizing resource efficiency.
4. To propose a practical framework for integrating sustainable packaging into Malaysia’s courier service industry, including recommendations for businesses, policymakers, and stakeholders.
5. To contribute to the knowledge base in academia and industry regarding green logistics: bridge the existing research voids pertaining to CE practices in the logistics and courier sectors, particularly in emerging markets like Malaysia.

1.4 Research questions

The following research questions guide this study:

1. What are the current packaging practices in Malaysia’s courier service industry, and to what extent are they sustainable?
2. What are the key barriers to adopting sustainable packaging and CE principles in the Malaysian courier service sector?
3. How can adopting circular economic principles, particularly sustainable packaging, lead to environmental and economic benefits for industry?
4. What strategies can be implemented to overcome the barriers to adopting sustainable packaging in the courier service industry?

2. LITERATURE REVIEW

2.1 Circular economy in the service industry

The CE concept is the one that has been historically linked to manufacturing and resource-intensive industries [8], yet gained a lot of popularity in academics and policy circles when it comes to services and their application. The concept of CE has its own opportunities and challenges in the service economy characterized by the creation of intangible value, contact with clients, and proposing services based on experience. In contrast to the traditional models that focus on linear delivery of service and throughput of resources, circular service models focus on the maintenance of value through duration, efficiency of resources, reuse, and use of digital platforms to circulate resources and thereby support circular flows. Through the connection with the consumer, the service industry has a great opportunity to impact behavior, waste generation, and sustainable consumption habits and, therefore, catalyze the shift toward a regenerative economic system.

Moreover, digitalization is leading in terms of facilitating

circularity in service sector [9]. The Internet of Things (IoT), blockchain, and artificial intelligence (AI) are one of the technologies that can be used to trace the movement of materials, optimize the delivery roads, observe the use of products and enable the return or reuse of assets. These technologies allow moving away to the ownership-based models and towards service performance-based offerings, which are at the core of the thinking of the CE. Such innovations are able to aid reusable delivery systems, subscription based delivery, and customer platforms that reward sustainable behavior, in the courier business. What is more, the incorporation of CE principles into the service sector promotes other sustainability initiatives, such as carbon neutrality, zero waste, green employment (green jobs and skills), and the inclusion of diverse staff to establish effective employment.

The CE has gained traction across industries, including logistics and courier services, due to its potential to minimize waste, optimize resource use, and reduce environmental impact [7]. The traditional linear economy model, which focuses on resource extraction, production, consumption, and disposal, has led to significant environmental degradation. In contrast, CE promotes a closed-loop system in which resources are reused, refurbished, and recycled, keeping materials in use for as long as possible [10, 11].

In logistics, applying CE principles involves optimizing packaging materials, improving waste management, and creating systems that enable packaging reuse or recycling (Table 1) [12]. This model has been shown to reduce costs, improve supply chain efficiency, and enhance business resilience. CE in the service industry, particularly logistics, also helps reduce carbon emissions by minimizing waste and ensuring materials are repurposed rather than discarded.

Table 1. Comparison of linear vs. circular economy (CE) models in logistics

Dimension	Linear Economy	Circular Economy (CE)
Resource flow	Take–make–dispose	Reduce–reuse–recycle
Packaging design	Single-use, cost-driven	Reusable, recyclable, optimized
Waste management	End-of-pipe disposal	Closed-loop recovery systems
Environmental impact	High material loss and emissions	Reduced waste and resource intensity
Strategic focus	Short-term efficiency	Long-term sustainability and resilience

Source: Adapted from Bocken et al. [10] and Ghisellini et al. [11].

2.2 Sustainable packaging practices

Sustainable packaging is defined as the concept and application of packaging systems that cause minimal impact on the environment in their entire life and ecological drudgery [13]. They build resource efficiency, material circularity, and life cycle assessment (LCA) thinking, to minimize the use of virgin resources, to reduce carbon emissions and enhance end-of-life recoverability. When it comes to the courier service industry, where packaging is important in terms of a protection of goods, the branding of goods and delivery [14], the sustainable practices of packaging are rather regarded as a management strategy instead of an environmental issue. Developing consumer awareness, the regulatory factor, and

the worldwide transition toward the concepts of the circular economies are the drivers of this shift.

The other important aspect of sustainable practices is the aspect of social and ethical considerations that are to be included in sustainable packaging practices. The environmental performance of this selection of materials must be relevant, along with the attributes of labor practices, the transparency of the sourcing, and community impacts. As an example, sourcing packaging materials in the local area helps the regional economy and cuts emissions in the supply chain, whereas inclusive design can make the product more usable and the end-user can follow the instructions to sort the ends of the labels. Courier firms are also starting to see the value in mobilizing consumers around the sustainability agenda by putting on-the-package messages, eco-labels, and checkout options to order green delivery services.

In addition, data and analytics are promoting the optimization of packaging and the reduction of waste. LCA tools allow organizations to measure and determine the environmental impact of different types of material used in packaging and packages, and that helps make those decisions (swap materials, redesign) driven by data, rather than intuitively. Parcel-size analysis and fragility of the various products can automatically suggest the most material efficient packaging that takes the least space by reducing the void space and cushioning requirements as analyzed by the software platforms [14]. These technologies are especially applicable to high-volume fulfillment centers, baggage centers, and courier facilities located in urban areas of Malaysia because competitiveness is predicated on both efficiency and control of costs.

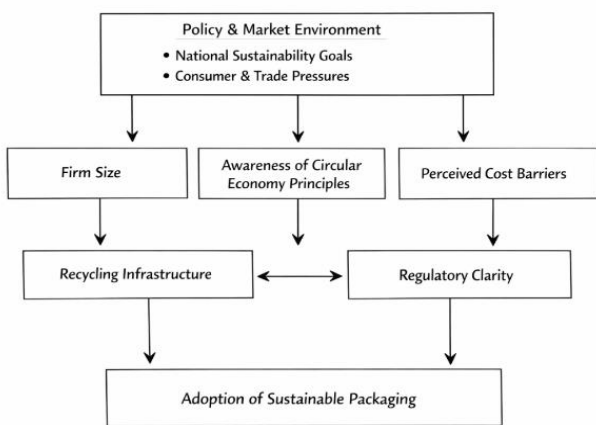


Figure 1. Conceptual framework illustrating the determinants of sustainable packaging adoption in the Malaysian courier service industry, grounded in CE principles

The environmental impact of packaging waste is immense, particularly in countries like Malaysia, where waste management systems are often underdeveloped. Studies have shown that sustainable packaging can drastically reduce waste sent to landfills and promote a cleaner, more sustainable environment (Figure 1) [5].

Sustainable packaging is a critical component of the CE, as it directly addresses one of the largest environmental challenges in logistics, the generation of packaging waste. Sustainable packaging refers to packaging materials that are recyclable, biodegradable, or reusable, designed to reduce environmental impact. In recent years, businesses across the logistics and courier sectors have increasingly adopted

sustainable packaging to reduce their carbon footprints, comply with environmental regulations, and meet consumer demand for eco-friendly products [15].

A study by Accorsi et al. [16] found that adopting sustainable packaging reduces waste management costs and provides long-term financial savings. Furthermore, sustainable packaging enhances brand reputation, as environmentally conscious consumers prefer companies that demonstrate commitment to sustainability. Sustainable packaging materials, such as biodegradable plastics, recycled cardboard, and reusable packaging, are gaining traction in logistics due to their positive impact on reducing waste.

2.3 The Malaysian courier service industry

The Malaysian courier service industry has grown rapidly, fueled by the expansion of e-commerce. This growth, however, has led to a surge in packaging waste, primarily from single-use plastics and non-recyclable materials. According to a report, over 80% of the packaging materials used by Malaysian courier companies are non-recyclable. This dependency on unsustainable packaging materials presents a significant challenge for the industry, particularly as the government and consumers increasingly push for more sustainable practices.

The adoption of sustainable packaging in Malaysia’s courier service industry has been slow, but some companies have begun implementing pilot programs to reduce packaging waste. Larger courier companies such as Pos Malaysia and GDEX have taken steps toward adopting recyclable and biodegradable packaging materials. However, smaller courier firms face significant barriers, including high initial costs, limited access to sustainable packaging options, and limited recycling infrastructure in certain regions (Table 2) [7].

Some efforts have been made in government policy to focus on sustainability in logistics, with the National Transport Policy (2019–2030) and the Malaysia Roadmap towards single-use plastics (2018–2030) in this period beginning to address this issue, yet industry participation remains inconsistent. Some courier companies have even experimented with the use of reusable packaging, the adoption of route optimization technologies, and the consideration of biodegradable packages; however, industry-wide conversion is slowed by cost constraints, consumer appeal, and lack of industry-wide coordination. The sector is also dependent on the SMEs and independent riders, which complicates the transition even more, as smaller operators tend to have limitations when applying sustainable operations due to capital and knowledge constraints.

Environmental sustainability is a serious concern for packaging practices in the Malaysian courier industry. The tendency to apply the MPs of bubble wrap, polystyrene fillers, and multilayer laminated bags is an indication that the industry does prefer cost-effectiveness and service life beyond environmental awareness. Although such materials successfully package parcels using them in the entire supply chain, they also cause plastic waste and landfill deposits, as well as produce greenhouse gas emissions in production and discarding. What is more, most of these items cannot be recycled within the existing Malaysian waste infrastructure because of contamination, mixed materials or due to a lack of sorting infrastructure. Even though some courier companies have deployed branded recyclable boxes or even compost mailers, their use is not massive or obligatory.

Table 2. Market share of major courier companies in Malaysia (2020)

Company	Approximate Market Share (%)	Sustainability Initiatives
Pos Malaysia	35	Limited adoption of recyclable packaging
GDEX	20	Pilot use of recyclable and biodegradable packaging
Ninja Van	15	Collaboration with eco-packaging suppliers
Lalamove	10	No formal sustainable packaging program
Others	20	Varying levels of adoption

Note: Figures represent indicative estimates synthesized from company annual and sustainability reports, industry briefings, and secondary logistics market analyses published between 2019 and 2021. Values are intended to illustrate relative industry structure rather than exact market dominance.

2.4 Barriers to the adoption of sustainable packaging

While the potential for sustainable packaging in Malaysia’s courier service industry is significant, several barriers prevent widespread adoption. These barriers include high initial costs, lack of infrastructure, and insufficient consumer demand for eco-friendly packaging, and most courier businesses continue to use single-use materials such as polyethylene (PE) mailer bags, bubble wrap, corrugated cardboard boxes, which are cheap, lightweight, and protective. Although these materials perform effectively in terms of parcel integrity in transit, they are a source of municipal solid waste and plastic litter, especially given Malaysia’s weak recycling system and poorly maintained waste segregation systems. In particular, the packaging decisions made by many small and medium-sized courier operators serving last-mile deliveries have not been subject to a formal sustainability policy (let alone an actual policy) and, thus, have been made with operational efficiency rather than environmental performance in mind.

High initial costs are often seen as a significant deterrent for SMEs. According to Zhu et al. [17], the price of sustainable packaging materials is generally higher than that of conventional packaging, which makes SMEs hesitant to invest in these solutions. Furthermore, the lack of recycling infrastructure in Malaysia, especially in rural and suburban areas, hinders the recycling or repurposing of packaging materials, a key principle of the CE (Table 3) [7].

Additionally, while consumers are increasingly aware of environmental issues, many remain reluctant to pay a premium for products with sustainable packaging [12, 18]. This limits demand for eco-friendly packaging, making it difficult for companies to justify switching to sustainable alternatives.

In general, adopting CE principles enables the courier service sector to harmonize environmental responsibility with business resilience, promoting a sustainable growth path that benefits both the economy and the ecosystem.

The existing scenario on both fronts indicates that the courier industry in Malaysia is undergoing gradual transformations to attain sustainability, but due to the economic, infrastructural, and behavioral limitations, the rate of progress in Malaysia is being brought down. A viable change cannot be implemented without the efforts of courier companies, government institutions, packaging suppliers, and consumers to drive the change with the help of policy comprehension, subsidies, and education. When all these efforts are coordinated, they can fast-track the shift towards

green initiatives to sustainable packaging and establish Malaysia as an example of green logistics in the ASEAN market.

Table 3. Ranked barriers to sustainable packaging adoption based on survey responses

Barrier	Percentage of Firms Reporting (%)	Mean Agreement Score
High initial cost of sustainable materials	65	4.21
Limited recycling and recovery infrastructure	53	3.98
Low consumer willingness to pay	41	3.64
Regulatory uncertainty	37	3.52
Limited availability of green packaging suppliers	34	3.47

3. RESEARCH METHODOLOGY

3.1 Research design

This study adopts a mixed-methods research design to examine sustainable packaging adoption within Malaysia’s courier service industry. The mixed-methods approach was selected to capture both the measurable patterns of adoption across firms and the contextual explanations underlying managerial decision-making, consistent with established logistics and sustainability research. Quantitative survey data provide generalizable insights into adoption drivers and barriers, while qualitative interviews deepen understanding of operational and institutional constraints.

3.2 Sampling frame, strategy, and data collection

The sampling frame comprised registered courier companies, logistics service providers, and last-mile delivery operators operating in Malaysia. Firms were identified through industry directories, courier association listings, and publicly available corporate records. A purposive stratified sampling strategy was employed to ensure representation across firm sizes (micro, small, medium, and large enterprises) and operational scales, consistent with SME Corp Malaysia classifications.

The survey was administered between March and May 2024 and focused on firms operating in major logistics hubs, including the Klang Valley, Penang, and Johor, where e-commerce activity is most concentrated. A total of 150 questionnaires were distributed, of which 100 usable responses were returned, yielding a response rate of 66.7%, which is acceptable for organizational survey research in logistics contexts.

To assess potential non-response bias, an early-late respondent comparison was conducted following the procedure of Armstrong and Overton [19]. Independent sample tests revealed no statistically significant differences across key variables, suggesting that non-response bias was unlikely to materially affect the findings.

3.3 Research ethics and consent

Participation in the study was voluntary. All respondents

were informed of the study’s purpose, assured of confidentiality, and provided informed consent prior to participation. No personally identifiable information was collected, and responses were analyzed in aggregate. Interview participants provided verbal consent, and all recordings were anonymized prior to transcription.

3.4 Survey instrument and measurement development

The survey instrument was developed based on prior empirical studies on sustainable logistics, CE adoption, and green packaging practices [9, 13]. Items were adapted to reflect the Malaysian courier context. The questionnaire consisted of four sections: firm characteristics, current packaging practices, awareness of CE principles, and perceived barriers to sustainable packaging adoption.

All perceptual items were measured using a five-point Likert scale ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). Firm size was operationalized according to SME Corp Malaysia definitions, classifying firms as micro, small, medium, or large based on employment size and annual turnover.

3.5 Reliability and validity assessment

Internal consistency reliability was assessed using Cronbach’s alpha, with all multi-item constructs exceeding the recommended threshold of 0.70. Construct validity was evaluated using exploratory factor analysis. The Kaiser–Meyer–Olkin (KMO) measure exceeded 0.70, and Bartlett’s test of sphericity was statistically significant ($p < 0.001$), indicating suitability for factor analysis. Factor loadings exceeded 0.60, supporting convergent validity.

3.6 Qualitative interviews and coding procedure

To complement the survey findings, ten semi-structured interviews were conducted with senior managers and sustainability officers from courier firms. Interview questions focused on packaging decision-making, regulatory pressures, cost constraints, and the feasibility of circular packaging systems. Interviews were transcribed verbatim and analyzed using thematic analysis. Coding followed an iterative process of open coding, axial coding, and theme refinement. Data saturation was achieved when no new themes emerged from subsequent interviews.

4. FINDINGS AND DISCUSSIONS

Quantitative analysis indicates that firm size is a statistically significant determinant of sustainable packaging adoption. Chi-square tests reveal a significant association between firm size category and adoption status ($\chi^2, p < 0.05$), with medium and large firms exhibiting higher adoption rates than micro and small enterprises. Independent-sample tests further indicate that firms adopting sustainable packaging report significantly higher awareness of CE principles and regulatory expectations.

To further examine adoption determinants, a binary logistic regression model was estimated, with sustainable packaging adoption as the dependent variable. The results suggest that firm size, perceived long-term cost savings, and regulatory awareness positively influence the likelihood of adoption, whereas perceived upfront cost barriers negatively affect it.

These findings are consistent with prior logistics and sustainability studies in emerging markets [9, 13].

4.1 Operational definition

In this study, sustainable packaging is operationalized as packaging systems that meet at least one of the following criteria: (i) use of recyclable or compostable materials compliant with nationally recognized standards, (ii) incorporation of recycled content, (iii) reusability through multiple delivery cycles, or (iv) demonstrable reduction in material intensity based on life-cycle assessment principles (ISO 14040 framework) (Table 4).

Table 4. Operationalisation of key constructs

Construct	Operational Definition	Measurement Reference
Sustainable packaging adoption	Use of recyclable, reusable, or reduced-material packaging aligned with life-cycle assessment principles	ISO 14040 [12]
Firm size	Micro, small, medium, or large enterprise based on employment size and annual turnover	SME Corp Malaysia
Circular economy awareness	Level of managerial knowledge of CE principles and sustainability policies	[7]
Cost barrier	Perceived upfront financial burden of sustainable packaging materials	[17]
Infrastructure availability	Access to recycling, collection, or recovery facilities	[20]

4.2 Current practices in sustainable packaging

Sustainable packaging is a practice that exists in the Malaysian courier service industry, though in its early stages, but progressively coming around as a practice that is logistically conscientious. Because e-commerce is gaining momentum rapidly due to digitalization, the widespread adoption of smartphones, and new consumer behaviors, the number of parcel deliveries is increasing dramatically.

The study’s findings indicate that sustainable packaging adoption in Malaysia’s courier service industry is still in its nascent stages. Of the 100 surveyed companies, 40% reported using sustainable packaging materials such as biodegradable plastics, recyclable cardboard, and paper-based products. However, 60% of respondents stated that they still predominantly rely on traditional packaging materials such as plastic, Styrofoam, and other non-recyclable options. This highlights a significant gap between the growing awareness of sustainability and its actual implementation within the industry.

Larger courier companies, particularly those with over 100 employees, were more likely to adopt sustainable packaging practices. For instance, Pos Malaysia and GDEX reported ongoing initiatives to integrate recyclable and biodegradable packaging materials. These companies often have more financial resources, enabling them to experiment with eco-friendly alternatives despite the higher initial cost of

sustainable packaging materials.

On the other hand, smaller firms, particularly those with fewer than 50 employees, face significant challenges in adopting these practices. Many of these companies expressed concerns about the financial viability of investing in sustainable packaging because eco-friendly materials are more expensive. These smaller firms also struggle to access suppliers of sustainable packaging solutions, exacerbating the issue. Therefore, the current adoption of sustainable packaging remains skewed towards larger, more resourceful companies, leaving SMEs with limited capacity to transition to circular economic practices.

Any action to stimulate recycling or reuse of the packaging materials is quite feeble and uncoordinated. Although there are a few collection stations for used boxes and mailers in cities, there is no centralized return or reverse logistics system to enable processing of the volumes across a broader set of recovery and remailing to the supply chain. Also, take the example of reusable packaging being heavily touted in other European markets, including tote bags and collapsible containers. There are almost none of these in the courier system in Malaysia, mainly due to logistical limitations, non-standardization, and poor buyer attention. On the same note, QR-coded or intelligent packaging that enables tracking, reuse or disposal instructions has not been properly tested on the local level.

Despite these challenges, the awareness of sustainable packaging and its importance is growing in the industry. 40% of respondents indicated that they were actively exploring options to integrate more sustainable materials into their packaging processes. This shows a positive shift towards sustainability, although the pace of adoption remains slow and is hindered by various barriers.

Figure 2 presents a bar chart comparing the percentage of companies using sustainable packaging versus those that still rely on traditional, non-recyclable materials.



Figure 2. Percentage of companies using sustainable packaging

4.3 Barriers to the adoption of sustainable packaging

The study identified several key barriers that hinder the widespread adoption of sustainable packaging practices in Malaysia's courier service industry. These barriers are multifaceted, ranging from financial constraints to infrastructure limitations, and pose significant challenges for companies seeking to transition to more sustainable packaging solutions. Although more and more people worldwide support environmental sustainability and recognize the potential of

sustainable production and the CE to reduce waste, practical efforts to implement eco-friendly packaging options in the Malaysian logistics and courier industry remain limited in many respects. These barriers are important to understand in order to devise workable tactics for a move towards greener supply chain activities.

The most cited barrier by respondents was high initial costs. According to 65% of the companies surveyed, the upfront cost of sustainable packaging materials was perceived as a significant obstacle. Eco-friendly packaging materials, such as biodegradable plastics and recyclable cardboard, tend to cost more than traditional packaging materials, which creates a financial barrier, particularly for SMEs. These higher costs often make it difficult for companies to justify the investment, especially when short-term profitability is a priority. The Malaysian courier industry is also facing intense price competition due to e-commerce, where consumers demand low-cost or even free deliveries. With this cutthroat competition, there is hardly any scope for companies to offset the extra cost of using eco-friendly packaging, so cost is one of the strongest reasons why few companies that attempt to adopt some sustainable practices end up adopting only a few.

In addition to the financial costs, the lack of infrastructure for recycling and material recovery was another major barrier identified by 53% of respondents. While larger courier companies may have the resources to manage recycling and waste processing within their operations, smaller companies often lack access to such infrastructure. The lack of accessible recycling facilities in many parts of Malaysia makes it difficult for companies to manage waste effectively, reducing the incentive to adopt sustainable packaging solutions. It is also apparent that Malaysia lacks significant domestic manufacturing capacity for biodegradable, recyclable packaging materials. Consequently, most environment friendly packaging items had to be imported most of which came in China or Thailand or other regional players. The purchase of these materials not only increases procurement expenses due to exchange rate fluctuations, delivery charges, and duties, but also generates supply chain risks related to availability and lead times. Couriers and packaging suppliers have voiced concerns about performance and scalability in sourcing green packaging materials, particularly during times of global supply chain disruption, including the COVID-19 pandemic.

Furthermore, 41% of companies reported that the lack of consumer demand for sustainable packaging was a significant challenge. Despite growing awareness about environmental issues, many consumers still prioritize cost and convenience over sustainability. As a result, businesses often feel that investing in sustainable packaging may not yield significant returns if consumer demand remains low. The need for greater consumer education and awareness was frequently highlighted as a critical step in overcoming this barrier.

Another daunting obstacle is the changing operational and logistics challenges. The changes in current logistics models are of great significance for achieving circular packaging systems through reusable containers or take-back programs. The majority of courier industries in Malaysia are based on the linear model of a send and dispose model that includes the use of packaging that only gets disposed at the end of the chain by the final recipient. A switch to the circular system would require investments in reverse logistics infrastructure, including collection, sorting, cleaning, and redistribution of reusable packaging. Not only is this a costly process, but it is

also logistically difficult, especially in geographically diverse Malaysia, which comprises urban centers, suburban areas, and rural areas. Complex logistics by itself and the extra resources required to handle the logistics of retrieving the packaging material at thousands of spread-out delivery points would be beyond the priorities of many companies at the moment.

Although the country has already established the Roadmap Towards Zero Single Use Plastics 2018-2030, the strategy does not clearly outline sustainable packaging requirements in the logistics and courier industries. Lacking both legally binding and industry-specific regulations, there is no regulatory incentive compelling most courier companies to adopt green packaging solutions. Besides, no financial support, in the form of tax rebates, subsidies, or grants, is provided to cover the cost of switching to sustainable materials. Such a regulatory vacuum leaves the decision to use green packaging largely in the hands of corporate social responsibility (CSR), which, most of the time, is secondary to business interests.

Market demand and consumer behavior are other factors influencing packaging practices, and in Malaysia, this is another barrier. Although some urban regions have raised awareness of environmental conservation, the vast majority of Malaysian consumers prefer fast, cheap delivery over environmentally friendly packaging. A large share of customers is not yet ready to pay a premium for green delivery, and consumer demand for environmentally friendly practices among courier companies is not as pressing. This absence of consumer global packaging marketing for plastic packaging reduces the incentive for courier services to invest in eco-packaging. In addition, most small and medium-sized online merchants in Malaysia, which form a large segment of e-commerce enterprises in the country, are unwilling to adopt sustainable packaging due to concerns about cost-effectiveness and customer demand to protect their goods during delivery.

There are also technological constraints to adopting sustainable packaging. It is unlikely that all the current eco-friendly materials on the market can meet the needs of the courier industry in Malaysia. For example, when comparing biodegradable mailers and plastic mailers, the former can exhibit reduced product protection, water resistance, and durability, which can endanger products during high-humidity rainy seasons in Malaysia or when delivered to rural locations over long distances. The invention of highly efficient, sustainable packaging technologies that rival, and in some cases exceed, the workability efficiency of plastic packaging remains under development and might not be readily available or affordable to most industries.

Lastly, logistical challenges also contribute to the slow adoption of sustainable packaging. Many companies noted that sustainable packaging solutions are often more complex from a supply chain perspective and require closer coordination with suppliers. This can be especially difficult for SMEs, which lack the resources to enter into long-term partnerships with eco-friendly packaging suppliers.

4.4 Opportunities for improvement and transformation

While the barriers to adopting sustainable packaging are significant, the study also revealed several opportunities for improvement that could drive the widespread adoption of CE practices in Malaysia's courier service industry. The courier and logistics industry can be instrumental in helping the country move closer to its sustainability goals for the

environment by reducing packaging waste and fostering the CE. They are not just environmental necessities but also strategic options for long-term competitiveness, corporate responsibility, and alignment with global green supply chain trends. The adoption of more sustainable packaging practices in the courier industry could be boosted through technological innovation, policy support, consumer engagement, and collaboration.

One of the primary opportunities identified is the potential for government support in facilitating the transition to sustainable packaging. Several respondents suggested that the Malaysian government could play a crucial role by providing financial incentives or tax relief for companies that adopt sustainable packaging solutions. Government policies could also help to level the playing field between larger companies with more resources and smaller businesses that struggle with the higher costs of sustainable packaging. Moreover, regulations requiring companies to use a certain percentage of recyclable or biodegradable packaging could provide a strong incentive for the industry to adopt CE practices. As global environmental concerns grow, government intervention could accelerate the shift toward more sustainable practices in the courier industry.

Another key opportunity lies in industry collaboration. Several industry players expressed the need for more cooperation between logistics companies, packaging suppliers, and local governments. Such collaboration could help overcome the financial and logistical barriers that many SMEs face in adopting sustainable packaging. For example, by partnering with packaging suppliers to secure bulk discounts on eco-friendly materials, courier companies could reduce the upfront costs of switching to sustainable packaging. Additionally, industry-wide initiatives could help create shared infrastructure for recycling and material recovery, particularly in underserved areas of Malaysia.

Possibilities of further transformation are presented by advances in technology and digitalization. Smart packaging features, such as QR codes, Radio-Frequency Identification (RFID) tags, and blockchain-enabled tracking throughout the life cycle, can also help boost transparency and promote take-back or reuse initiatives. For example, platform-giant reusable packaging can track how many times it is used and returned, allow courier companies to manage returns without the burden of tracking them, and encourage customer rewards to engage in circular systems. Digital networking would also accommodate pooling systems for packaging, where the uniformity and reusability of packaging across different logistics providers are multiplied, decreasing costs and enhancing productivity. Also, green checkout, which allows customers to choose environmentally friendly packaging for their deliveries, can be introduced on e-commerce sites. Companies can also reduce packaging waste by optimizing product packaging using machine learning and AI-enabled algorithms to improve package size and fill gaps, and eliminate the need for excess fillers and overpackaging.

Consumer education emerged as another significant opportunity for encouraging the adoption of sustainable packaging [21]. The study found that 41% of respondents believed that consumer demand for eco-friendly packaging was too low to justify the investment. However, there is a growing trend of consumers becoming more environmentally conscious. By investing in consumer awareness campaigns and educating the public about the benefits of sustainable packaging, companies can foster a market more supportive of

green initiatives. Such initiatives could involve partnerships with NGOs or local environmental organizations to promote sustainable packaging through awareness programs, social media campaigns, or in-store promotions.

Another important area for development is reverse logistics infrastructure [22]. Most courier services currently offer one-way delivery, with little or no ability to package returns. Nevertheless, by integrating reverse logistics into current networks, businesses can establish cyclical ratios for packaging materials, waste, and resource depletion [22]. Collection of used packaging could be simplified by implementing parcel lockers, drop-off points, or service points in a central location, or by collaborating with retail stores, to ensure returns are easier for consumers. Reverse logistics, to the extent it is developed, also works towards attainment of the sustainability targets but it has a bonus effect of providing an alternate income channel in form of recycling agreements and material recovery as well as resale of used packaging resources and materials.

Lastly, companies in the courier service industry can gain a competitive advantage by adopting sustainable packaging. Many consumers are now willing to pay a premium for eco-friendly products and services. According to White et al. [21], businesses that embrace sustainability not only improve their environmental footprint but also enhance their brand reputation. This can be a critical factor in attracting environmentally conscious customers and building long-term customer loyalty. For companies in Malaysia's courier service industry, embracing CE principles could be a key differentiator in a highly competitive market.

In short, there are so many opportunities for the Malaysian courier service industry to enhance and change its packaging to make it more sustainable. By means of technological solutions, policy, consumer satisfaction, industry cooperation, reverse logistics, supplier cooperation, employee education, and the use of the CE, the industry can transform its existing linear system to a more responsible, environmental, and CE-friendly packaging system. Such opportunities will not only reduce environmental risks but also make the logistics business in Malaysia the forerunner in sustainable supply chain management in Southeast Asia.

4.5 Sustainability as a driver of long-term profitability

Adopting sustainable packaging not only provides environmental benefits but can also contribute to long-term profitability [23]. Several respondents noted that while the initial investment in sustainable packaging materials is higher, the long-term savings on waste disposal and packaging costs can offset the upfront expenses. By reducing waste, companies can lower their operational costs, especially in areas such as packaging material procurement and waste management. Furthermore, adopting sustainable packaging can enhance a company's brand image, allowing it to tap into the growing market of environmentally conscious consumers. Malaysian courier industry, sustainability, especially in its packaging, gives the industry a strategic road towards assuring continued survival, not increasing the cost of its operations in the long view as well as keeping in tandem with emerging global market expectations.

Another important dimension in which sustainability can lead to profitability is the improvement of brand reputation and customer loyalty. Contemporary customers, particularly millennials and members of Generation Z, are increasingly

environmentally aware and more likely to favor businesses committed to green practices. E-commerce and courier companies that also offer sustainable packaging solutions are likely to achieve higher customer retention, stronger word-of-mouth recommendations, and greater brand distinction in a highly competitive field. A strong sustainability profile will strengthen the corporation's image and make it more trustworthy, which is crucial for customer acquisition and retention. In this case, in Malaysia, where the environment is characterized by extremely high industry rivalry and low switching costs, it is a serious advantage for a firm to distinguish itself as environmentally friendly. When companies align with consumers' values, they can charge higher prices, build emotional loyalty, and grow lifetime customer value.

Another long-term profitability factor related to sustainability is operational resilience. Business continuity has increasingly been threatened by climate change, resource scarcity, and supply chain disruptions. By using eco-friendly packaging and the principles of the CE, the courier firms would limit their exposure to potentially volatile raw-materials markets, such as petroleum-based plastics, and insulate themselves against price shocks, fuel availability shortages, and geopolitical risks in fossil-based fuel supply chains. The use of recycled or locally sourced biodegradable materials will also support supply chain localization and limit global imports, thereby improving supply stability. Moreover, there are process innovations that are frequently driven by sustainable practices, in which businesses redesign processes, streamline routes, reduce greenhouse gas emissions, and operate more efficiently and nimbly, positioning them better to respond to market changes.

Sustainability also brings new sources of income and profit-making business model innovations. As another example, courier businesses can charge higher rates, while eco-friendly shoppers can choose carbon-neutral or very few-package delivery services. Businesses can create packaging-as-a-service applications, renting reusable packaging to clients, handling returns via reverse logistics, and thereby generating more revenue while decreasing waste. Partnerships in waste recovery and recycling can also generate revenue from post-consumer packaging materials, turning a cost center into a profit-making operation.

By incorporating sustainability into their core services, courier companies can position themselves in the green economy, expand into new markets, and reach new client groups focused on ethical, eco-friendly consumption. The remaining ways sustainability relates to profitability are employee engagement and staff retention. Businesses that are committed to sustainability tend to have higher staff morale, participation, and performance. One more result is the increase in the company's positive social and environmental impact, and workers want to identify with companies that make this impact, resulting in a decreased turnover rate, lower recruitment costs, and a strengthened organizational culture.

In the logistics and courier service industry in Malaysia, where competition to acquire skilled workforce is becoming stiff, a strong CSR image can act as a talent magnet, ensuring workforce stability and operations at a higher level.

Prior research suggests that eco-friendly packaging can positively influence consumer perceptions, purchase intention, and customer loyalty. As more consumers become aware of the environmental impact of their purchases, companies that integrate sustainable packaging into their supply chains are

likely to attract a larger customer base. Therefore, sustainability should not be seen as a cost but as an investment in long-term profitability.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Recommendations

Based on the findings of this study, several key recommendations can be made to help Malaysia’s courier service industry transition to more sustainable packaging practices and embrace CE principles. One of the most crucial steps is government intervention and support. The Malaysian government plays a vital role in encouraging businesses to adopt circular-economy practices, especially in packaging. Financial incentives, such as tax breaks or grants, could help offset the higher initial costs of sustainable packaging materials, which are currently a significant barrier for many companies, particularly SMEs. These financial incentives could be structured to encourage companies to make long-term sustainability investments by covering the costs of transitioning to recyclable and biodegradable materials. Moreover, the government should consider introducing regulations requiring a minimum percentage of recyclable or biodegradable packaging in the logistics and courier services industry. The Malaysian government must enhance the policy and regulatory framework by introducing guidelines and requirements specific to the logistics and courier industries, including EPR programs, tax incentives to promote green innovation, and national requirements for sustainable packaging (Table 5). Second, multi-stakeholder platforms, such as those led by courier companies, packaging manufacturers, governments, and civil society, should be encouraged to share knowledge and coordinate action across the industry.

Table 5. Policy–packaging relevance matrix

Policy Instrument	Key Provision	Relevance to Courier Packaging
Extended Producer Responsibility (EPR) (Malaysia)	Producer accountability for packaging waste	Encourages recyclable and reusable courier packaging
Malaysia Plastics Sustainability Roadmap 2021–2030	Reduction of single-use plastics	Drives transition to sustainable mailers
Roadmap Towards Zero Single-Use Plastics 2018–2030	Phased reduction targets	Affects express delivery packaging formats
12th Malaysia Plan	CE and green logistics	Institutional support for sustainable logistics
EU Packaging and Packaging Waste Regulation (PPWR)	Recyclability and reuse requirements	Compliance for export-oriented courier services

In addition to governmental support, industry collaboration is essential for overcoming the current barriers. Companies in the courier service sector, especially SMEs, need to work together with packaging suppliers, environmental organizations, and local authorities to build a robust supply chain for sustainable packaging. Collaborative efforts could include bulk purchasing agreements with packaging suppliers to reduce the cost of sustainable materials or the creation of

shared recycling infrastructure that benefits all industry players. By working together, companies can reduce operational costs, innovate in packaging design, and improve waste management.

Furthermore, consumer education and awareness are critical in increasing demand for sustainable packaging. While many consumers are increasingly concerned about environmental issues, there remains a significant gap in understanding the impact of packaging waste. Although the issue of the environment is gaining popularity worldwide, most consumers and small-scale e-commerce sellers in Malaysia lack in-depth knowledge of how excessive packaging harms the environment and how non-recyclable packaging is harmful. Businesses must take proactive steps to educate consumers about the benefits of eco-friendly packaging and encourage them to choose products with sustainable packaging solutions. This could be done through targeted marketing campaigns, partnerships with environmental NGOs, and clear labeling of sustainable products. As consumer demand for eco-friendly products grows, businesses will have stronger incentives to invest in sustainable packaging, which will help drive further adoption across the sector. The end goal should be a concerted effort to educate consumers, redefine expectations, make sustainability an essential part of the delivery experience, and foster a cultural shift that would fuel industry-wide change. The collective sway of consumers will gradually pick up steam as individuals with consumer power resonate more with ethical and environmental values in their purchases; this alone will give rise to the rise of sustainable innovation that will take over in a lead role in the courier logistics sphere.

Investment in research and development (R&D) is another key recommendation for businesses seeking to adopt sustainable packaging. R&D initiatives should focus on discovering new materials that are both cost-effective and environmentally friendly. Innovations in packaging design and materials—such as biodegradable plastics, edible packaging, or reusable solutions—could further lower costs and improve the sustainability of packaging materials. Example: QR-coded recyclables or returnable boxes with tracking systems. By investing in the development of new materials and technologies, businesses can remain competitive while also contributing to environmental sustainability. The creation of public-private partnerships must be established to ease pilot projects to experiment new sustainable packaging systems, namely compostable mailers that are made of agricultural by-products, reusable delivery bags that can be embedded in the reverse logistics system, and smart packaging technologies that are composed of QR code or embedded sensors that enable real-time tracking, recycling verification systems. These innovations can improve operational efficiency and traceability while enhancing user experience and environmental accountability. Nurturing a sustainable innovation system by integrating sustainability objectives into the national R&D agenda and fostering knowledge exchange across sectors can help Malaysia not only reduce environmental impact but also enhance its competitive advantage in the global green logistics market. Finally, a long-term R&D investment will lay the foundation for future change, as ideals move closer to the reality of commercially acceptable packaging.

Lastly, incentivizing SMEs to transition to sustainable packaging is vital for ensuring that the benefits of CE practices are accessible to all players in the industry. While large companies have the resources to invest in sustainable solutions,

SMEs often face significant financial barriers. Governments and industry bodies should offer financial support, low-interest loans, or tailored subsidies specifically for SMEs to ease their transition to more sustainable packaging solutions. In that respect, government agencies, logistics platforms, and packaging suppliers should unite to provide partially subsidized access to sustainable packaging resources and materials, standardized training modules on sustainable logistics, and a simplified compliance framework, while accounting for the constraints faced by small-scale operators. Such programs are supposed to focus both on practical measures, like proper sorting of the waste created by packaging, reuse of material in decent condition, and incorporation of low-cost return systems, and on long term business benefits of adopting sustainable practices, e.g., cost savings and better rep, and access to green certification or even a grant. Capacity-building should be accessible and open to everyone, in various formats and languages, to reach as many people as possible and be effective. It can be available in a mobile application, at a physical event in the form of a workshop, via a webinar, etc. Besides this, there should be mentorship programs or peer-learning platforms where SMEs can exchange information on the performance of best practices and innovations in their areas or spheres of operation. To institutionalize green values in the courier environment, policymakers ought to embed green principles as modules in entrepreneurship studies, as well as in cooperatives and gig-economy programs. By ensuring that SMEs and last-mile operators are not left isolated in the sustainability transition, Malaysia can move towards a more balanced, well-rounded shift towards circular-economy practices, ensuring a more robust environment and improved resilience of the national logistics sector.

5.2 Future research

While this study provides valuable insights into the current state of sustainable packaging in Malaysia's courier service industry, there are several avenues for further research to explore the broader implications of adopting CE practices in logistics. One of the primary areas for future research could involve measuring the financial impact of adopting sustainable packaging, particularly for SMEs. Many companies in the logistics and courier services sector have been hesitant to switch to sustainable packaging due to the perceived high upfront costs. Future studies could examine the long-term financial benefits, including cost savings from reduced waste disposal, the potential for enhanced brand loyalty, and improved operational efficiencies that could offset the initial investment in sustainable packaging. This kind of research would be valuable for decision-makers looking to make a compelling business case for sustainability in the sector and work likely to enhance the scholarly debate on sustainability packaging and CE principles, but also provide policymakers, industry leaders and all other stakeholders interested in expediting sustainability transitions in the various logistics-based systems and supply chains regarding supply chain promising innovation-oriented approaches, including the last-mile delivery systems.

Another area for future exploration is the environmental impact of widespread adoption of sustainable packaging in Malaysia's courier service industry. Research could focus on

quantifying the reduction in carbon emissions, waste generation, and resource consumption that could result from a transition to circular economic practices. Studies evaluating the environmental benefits of switching to sustainable packaging, such as biodegradable plastics, recycled materials, and reusable packaging, would provide concrete data to support the environmental case for sustainability. For instance, research could focus on LCAs of different types of packaging materials to determine which options offer the greatest environmental benefits.

Additionally, consumer behavior is a crucial area for future investigation. This study found that a lack of consumer demand for sustainable packaging is a significant barrier to its widespread adoption. Future research could examine the factors driving consumer willingness to pay a premium for products with sustainable packaging. Surveys, interviews, and focus groups could be conducted to understand consumer attitudes toward sustainable packaging, the role of sustainability in purchasing decisions, and the effectiveness of marketing campaigns that highlight eco-friendly products. By examining consumer behavior in greater detail, businesses could better tailor their sustainability initiatives to meet consumer expectations, thereby increasing demand for eco-friendly packaging.

Furthermore, one should examine additional digital solutions for reverse logistics, namely blockchain-verified packaging tracking, AI-based optimization of reverse logistics, and smart packaging equipped with tracking sensors or QR codes to increase circularity. Indeed, the unification of such technologies in the networks of the Malaysian couriers has yet to be explored in detail and bodes a great opportunity of innovation. Moreover, a comparative policy analysis benchmarking the regulatory environment in Malaysia against the top-ranking countries in sustainable logistics may help identify best practices and policy levers that can be activated in the Malaysian context.

Moreover, future research could focus on the role of technology in sustainable packaging. As technology continues to advance, there may be opportunities for innovations in packaging materials and recycling processes that significantly reduce the cost and environmental impact of packaging. Research into technologies such as blockchain for tracking packaging materials, smart packaging that reduces waste, or innovations in packaging recovery processes could provide businesses with new tools to make packaging more sustainable and circular.

Finally, policy development regarding sustainable packaging could benefit from further research. Studies exploring the impact of government regulations, incentives, and policies on the adoption of sustainable packaging in the logistics and courier service industries would help policymakers develop more effective strategies to drive sustainability. Future research could investigate the best global practices and examine how policy frameworks in other countries have successfully supported the transition to sustainable packaging in logistics and courier services.

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