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The future of packaging 2030 - An empirical analysis of decision-makers on the paperization trend

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In cooperation with Heidelberger Druckmaschinen AG

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1. Introduction

1.1. Relevance of the problem

Packaging is an integral part of nearly every consumer product — it protects, informs, stores, and sells. For decades, flexible plastic packaging dominated the market due to its functionality, availability, and low cost. Today, however, this dominance is under growing scrutiny. Mounting ecological concerns — especially plastic waste in oceans, microplastic pollution, reliance on fossil resources, and the limited recyclability of many plastics — have triggered a shift in perspective. Consumers, legislators, and companies are increasingly calling for solutions that are both functional and environmentally sustainable.

The European Union is driving this transformation through regulation. With the new Packaging and Packaging Waste Regulation (PPWR), the EU aims to fundamentally reshape the packaging landscape by 2030. This regulation requires companies to significantly improve the sustainability of their packaging, increase the use of recycled materials, close material loops, and eliminate problematic substances. In this context, the trend towards “paperization” — replacing plastic with fiber-based packaging — is gaining strong momentum.

The PPWR introduces sweeping changes for manufacturers, retailers, and consumers (European Commission, 2022). One of its core goals is to reduce packaging waste across the EU, targeting a 15% per capita reduction by 2040 compared to 2018 levels. The regulation also prohibits certain types of excessive single-use packaging, such as mini packs in hotels or double outer packaging in e-commerce. Overly bulky packaging designs will also be restricted by legal standards.

A central element of the PPWR is the requirement for verified recycled content: plastic packaging must contain minimum levels of recycled material, with quotas varying by packaging type and application. Additionally, mandatory reuse targets will apply to many product categories — including beverage and transport packaging — which must increasingly be designed for reuse or refill. The overarching goal is to promote a circular economy and minimize waste.

The new regulation also emphasizes a clear design-for-recycling approach. Packaging must be designed to be recyclable — meaning it should avoid composite materials, hard-to-separate layers, and excessive coatings. To support proper disposal, standardized EU-wide labelling will be introduced, using easily understandable symbols to guide consumers in sorting waste correctly. Extended producer responsibility will also be expanded: in the future, companies will bear higher costs for the collection, sorting, and recycling of their packaging.

A key objective of the PPWR is the harmonization of packaging regulations across the EU. Until now, member states have followed widely varying rules regarding packaging standards, recycling quotas, and substance restrictions. This national fragmentation is to be replaced by consistent, EU-wide requirements. The aim is to provide greater legal clarity — both for international corporations and for domestic stakeholders throughout the value chain.

Overall, the new regulation places strong emphasis on sustainability, resource efficiency, and the circular economy. For companies, this means stricter demands on packaging design, more extensive verification obligations, and in some cases, significant investments in material changes and infrastructure.

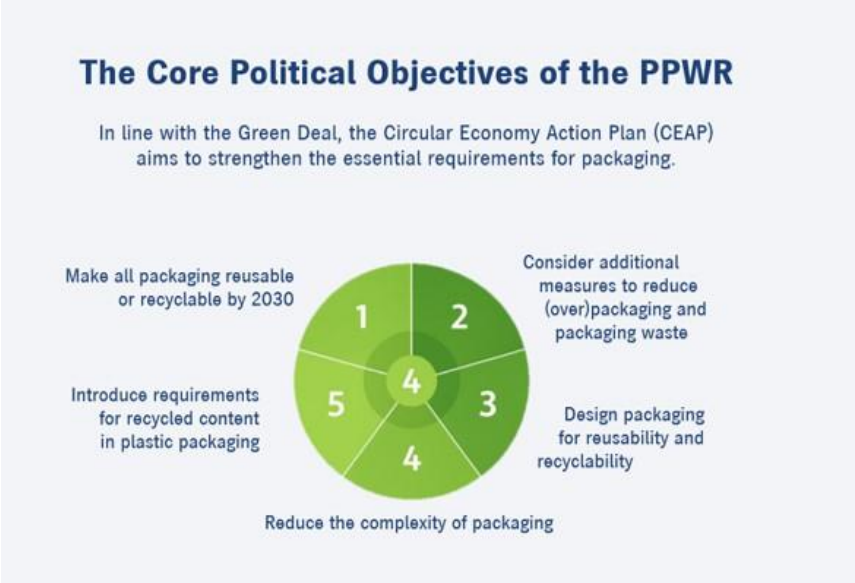

Figure 1: Core objectives of the PPWR

1.2. Objectives of the project

This study aims to provide a strategic understanding of the future development of the packaging market from the perspective of brand manufacturers and retailers. The primary focus is to assess the role that fiber-based packaging will play by 2030 in comparison to today's flexible plastic packaging — considering technological, economic, and regulatory factors. The goal is to identify specific fields of action for the development, sourcing, and application of sustainable packaging solutions. The project is intended to highlight opportunities, realistically evaluate conversion costs, and systematically capture the requirements for packaging manufacturers.

A particular objective is to define potential target packaging for various retail product segments, assess its suitability for industrial processes, and evaluate consumer acceptance. These findings aim to support more informed business and investment decisions, as well as guide strategic choices in packaging development.

1.3. Research questions

1. Which packaging trends and innovations are particularly relevant for brands and retailers in view of the year 2030?
2. What functional and legal requirements must future packaging meet — especially concerning recyclability, recycled content, product protection, and convenience?
3. In which product categories can flexible plastic packaging be replaced by fiber-based alternatives, and which materials and technologies offer practical solutions?
4. What life cycle costs (total cost of ownership) are associated with paper-based packaging compared to plastic alternatives?
5. What expectations do retailers and brands have of packaging suppliers in terms of sustainability, innovation, scalability, and communication?

1.4. Approach

The project was conducted in close collaboration with Heidelberger Druckmaschinen AG. It builds on extensive market observations and case studies of current packaging innovations and is based on expert interviews with stakeholders from brand management, packaging development, and retail. Regulatory documents — particularly the Packaging and Packaging Waste Regulation (PPWR) — as well as market development and consumer behavior studies, were also analyzed.

Different product segments — including food, personal care, and household goods — were examined in terms of packaging requirements, material use, and innovation potential. Special attention was given to "critical" applications where plastic currently offers clear functional advantages, as well as to areas where fiber-based alternatives are already in use. By combining qualitative and quantitative methods, the study provides a realistic picture of both the opportunities and challenges associated with the shift toward paper-based packaging ("paperization").

2. Theoretical background — packaging as the key to sustainable consumption

2.1. Role of packaging

Today, packaging is far more than just a product wrapper — it serves as an information carrier, a brand differentiator, a logistical component, and increasingly, a symbol of sustainability and corporate responsibility. A key finding from recent research is that packaging design and material selection not only influence consumer behavior but also have a significant environmental impact across the entire value chain. In industrialized countries like Germany, packaging waste accounts for a substantial share of household waste (UBA, 2022).

Studies indicate that confusion about proper waste separation, insufficient packaging information, and complex material combinations result in large volumes of packaging — particularly plastic — not being recycled, despite existing technical capabilities. This issue is especially pronounced in the fast-moving consumer goods (FMCG) and food sectors. Research from the University of Hohenheim highlights that clear design, comprehensible labeling, and material transparency significantly influence sorting behavior, making them direct levers for improving recycling rates (Wunderlich et al., 2021).

2.2. Green packaging and consumer preferences

Empirical research highlights that environmental friendliness is a key purchasing criterion. A conjoint analysis by Rokka and Uusitalo (2008) found that around one-third of consumers prioritize sustainable packaging over price or convenience.

In addition, empirical studies such as the one conducted by the German market research company. GfK on behalf of Pro Carton (2009) confirm that sustainable packaging is a key consumer criterion. According to this study, 64% of consumers consider environmentally friendly packaging materials to be important, 55% want as little plastic as possible and 74% emphasize the importance of recyclability. The results also show that cardboard packaging on the shelf is perceived as particularly environmentally friendly. This clear preference for paper-based packaging solutions underlines the high level of acceptance across society — especially among target groups that consume consciously, such as the "Responsibly Committed" and the "Critical Consumers" (cf. "Critical Consumers" (see GfK, 2009).

Studies by Ipsos (2022) and EY Future Consumer Index (2023) also show that Consumers demand sustainable solutions — and pay particular attention to the visual perception of environmental friendliness, for example through reduced design, paper textures and environmental seals. These packaging aesthetics have a significant impact on purchasing decisions — a key lever for sustainable packaging development in the retail sector.

Sustainability is very important for retailers and the industry, but the associated costs and the low or non-existent willingness of customers to pay are the biggest challenges according to a study by the German "*Zentrums für nachhaltige Unternehmensführung und der Lebensmittelzeitung*" (Center for Sustainable Corporate Management and Food newspaper — 2025). After the topic of health and safety for employees in the workplace, the topic of sustainable packaging and the avoidance of packaging comes in second place for manufacturers, with the avoidance of waste in third place. In retail, these topics are also at the top of the list, with the avoidance of waste ahead of packaging issues.

2.3. Paperization — opportunities and challenges

Paperization refers to the targeted shift from plastic to paper-based packaging solutions — particularly in the area of flexible packaging. This transformation is being significantly accelerated by regulatory measures, such as the EU Packaging and Packaging Waste Regulation (PPWR), as well as increasing societal pressure.

Figure 2: Application examples for paper solutions

According to McKinsey (2023), the market for sustainable paper solutions is growing rapidly — but there are challenges in terms of functionality, machinability and cost-effectiveness. While fiber-based solutions are already being used successfully for dry and uncooled products, their use for greasy or moist contents is technically more complex.

A study by Smithers Pira (2022) identifies cost, machine compatibility, and insufficient recycling infrastructure as the three main barriers to replacing plastic packaging with paper. Nevertheless, experts see significant future potential — particularly through the development of fiber-based packaging with functional barrier coatings and innovative material designs.

2.4. Packaging in a marketing context

According to Alhamdi (2020), packaging significantly influences the first moment of truth at the point of sale. In over 90% of cases, design plays a decisive role — especially in categories with a short decision-making period such as snacks, drinks or drugstore items.

Packaging therefore not only serves as product protection, but also as a strategic means of communication — especially in retail. Sustainable packaging can thus become a clear differentiating factor, as a representative survey by GfK (2022) underlines: 72% of consumers state that they actively prefer brands with environmentally friendly packaging.

2.5. Relevance for retail using the example of Lidl

Lidl's sustainability report for the 2022 and 2023 (2024) financial years provides a very good example of the resource-conserving use of transport and packaging materials along the value chain.

- **Paper consumption and use at Lidl**

Lidl makes extensive use of paper across its daily operations — including folding boxes, leaflets, customer magazines, printer paper, and external outer packaging. In the 2023 financial year, the company consumed a total of 101,597 tons of paper, with recycled paper accounting for 95.3% of that amount. Targeted measures, such as reducing the number of pages in advertising materials, led to a 10.9% reduction in paper consumption compared to the previous year.

Lidl also incorporates innovative paper materials into its packaging. Since the end of 2021, for example, the company has used Silphie paper for Bioland apple packaging. This material contains at least 20% fibers from the silphium plant and is processed without the use of chemicals — contributing to resource conservation and a more sustainable circular economy.

- **Recycling and circular economy strategy**

Lidl pursues a comprehensive recycling strategy supported by the Schwarz Group and its environmental division, PreZero. The company has established centralized recycling collection stations in all its stores and distribution centers to gather recyclable materials. Training programs and clear signage help improve waste separation quality, and customers can also use designated collection boxes in-store.

A key goal is to reduce the use of natural resources through optimized waste sorting and recycling. In 2023, 95% of the 607,561 tons of waste and recyclable materials generated by Lidl were reused, recycled, or fermented.

- **Recyclability of paper at Lidl**

Some of the recycled paper is reintegrated into Lidl's internal material cycle: through GreenCycle, collected paper and plastic waste are transformed into new products, such as toilet paper and foil bags, which are then reused in stores.

- **Objective**

By 2025, Lidl aims to significantly reduce its resource consumption, particularly through circular economy solutions and the consistent use of recyclable materials. The company's strategy focuses on material innovation, waste reduction, and recycling to lessen its ecological footprint.

2.6. Relevance for the project with Heidelberger Druckmaschinen AG

The insights gained from this project can be directly applied to the practical work of Heidelberger Druckmaschinen. The company's technologies enable the industrial printing and processing of highly functional paper packaging with barrier properties, precisely the kind of solution increasingly demanded by the market and regulators, as highlighted in recent studies.

The project bridges market demands with technical feasibility. By analyzing and simulating specific use cases, including product groups, target packaging formats, and recycling pathways, it provides a solid, practice-oriented foundation for strategic decision-making. While the research offers a scientifically grounded framework, Heidelberger Druckmaschinen delivers the industrial implementation.

As a leading technology provider in packaging printing, Heidelberger Druckmaschinen AG plays a pivotal role in advancing the paperization trend — the shift from plastic to fiber-based packaging. With its solutions for high-quality printing, finishing, and converting of fiber materials such as folding cartons, mono paper, and cardboard, the company equips brand manufacturers and packaging producers with the technical capabilities needed to sustainably transform their packaging systems.

A key technical challenge in the transition from plastic to paper is paper's limited barrier properties, particularly against moisture, grease, and oxygen. Heidelberger Druckmaschinen addresses this issue with specialized machine solutions and advanced barrier coating technologies that allow for the precise application of functional coatings. This enables the production of paper-based packaging that not only meets essential protective requirements but also remains recyclable. By avoiding composite materials and using sustainable inks and coatings, the company directly supports the design-for-recycling principle outlined in the new EU Packaging and Packaging Waste Regulation (PPWR).

Heidelberger Druckmaschinen is also engaged in numerous partnerships with brands, packaging manufacturers, and material developers to pilot practical, machine-compatible paper packaging formats. These collaborative projects test the feasibility of using new paper-based materials within existing production processes and scaling them to industrial levels. The goal is to develop solutions that are both functionally effective and economically viable.

Through this combination of technological innovation and strategic collaboration, Heidelberger Druckmaschinen is positioning itself as a key enabler of paperization. The company plays a vital role in driving the sustainable transformation of the packaging industry, not only by providing machinery, but also by partnering on holistic, recyclable packaging solutions. Increasingly active in presentations, technical publications, and industry forums, Heidelberger Druckmaschinen is emerging as a leading advocate for a recyclable packaging future — not as a paper producer, but as the technological interface between material innovation and industrial application.

3. Research design

As part of the 'Future of Packaging 2030' project with Heidelberger Druckmaschinen AG, a qualitative, empirically based research design was chosen. The aim was to gain practical insights into the status and development of paper packaging at companies from industry and trade from a wide variety of perspectives. The methodological approach is based on expert interviews, which were systematically evaluated and categorized.

3.1. Data collection

The data was collected between January 8 and March 11, 2025 as part of an integration seminar at the Baden-Württemberg Cooperative State University Heilbronn. A total of 21 structured expert interviews were conducted. The interviewees came from various industries such as food retail, DIY, fashion, electronics, logistics and packaging production.

List of participating companies:

Figure 3: Overview of the companies of the non-anonymized interviewees

The interviews were conducted using a standardized guideline containing a total of 13 key questions. The questions covered topics such as packaging strategy, regulatory requirements, technological innovations and consumer perceptions. The open formulation allowed for a high degree of in-depth content and industry specification.

The 13 key questions were formulated as follows:

1. What role does paper packaging play in your corporate strategy and how do you prioritize this topic?
2. Which materials are particularly relevant for your company and why?

3. What measures has your company already taken to meet the requirements of the PPWR?
4. Which innovations or technological developments do you see as particularly promising for paper packaging?
5. Are there specific products or product categories for which the switch to paper packaging is particularly easy or difficult?
6. What technical, legal or economic hurdles make it difficult to switch to paper packaging?
7. How do you assess the current recycling infrastructure and is it sufficient to make effective use of sustainable packaging solutions?
8. Are there any challenges or uncertainties that are slowing down the rapid implementation of the widespread introduction of paper packaging?
9. How do you perceive the acceptance of paper packaging among consumers or retail partners?
10. Do they have special requirements for packaging producers?
11. What support or incentives from politicians or industry associations would be necessary to accelerate the switch to paper packaging?
12. What do you think the packaging of the future will look like?
13. Do you have anything else to add?

3.2. Data analysis

Qualitative content analysis according to Mayring (2015) was used for the evaluation. The interview transcripts were coded using MAXQDA software and organized into content-relevant categories. Both deductive categories from the interview guidelines and inductively derived subcategories were applied to uncover new insights.

The coding allowed for a systematic analysis of the responses based on key thematic areas such as recyclability, cost structure, machine compatibility, and consumer acceptance. Differences in perspectives between industrial and retail companies were intentionally identified to enable cross-industry and nuanced conclusions about paper packaging.

3.3. Validity and limitations

To ensure validity, the interviewers were trained, a standardized interview procedure was followed, and the responses were coded using the dual control principle. Despite the high quality of the interview content, there are methodological limitations: the interviewees were not selected at random but based on their willingness and availability. This could lead to a certain bias toward particularly committed or innovative companies.

Conducting the expert interviews presented several challenges. One of the main difficulties was identifying suitable interview partners within companies. Of the more than 50 companies contacted, only 21 interviews were conducted, indicating a low prioritization of the topic within the industry. Many companies did not respond or deliberately declined to participate. Additionally, some interviews had to be anonymized, making it impossible to attribute the statements more precisely to specific industries.

Another challenge was the reluctance of many companies to adapt their sustainability strategies to legal requirements. Instead of taking early action, many are waiting until the regulatory framework is fully defined. This demonstrates how uncertainty in the legislative process can hinder proactive change.

A comparison of the experts' statements also reveals differing viewpoints on specific topics. For example, some experts view paper packaging as the most sustainable solution, while others argue that it often offers no ecological advantage over plastic. Similarly, opinions on consumer acceptance of sustainable packaging vary: while some experts report high demand, others emphasize that consumers are often unwilling to pay higher prices for sustainable alternatives in practice.

4. Results of the study

The key findings from the 21 expert interviews conducted are presented below. The analysis was structured thematically, based on the topics outlined in the interview guidelines. The statements were evaluated using systematic coding and categorized into five central topic areas:

4.1 Packaging strategy—including products, advantages, challenges, and innovations;
4.2 Regulatory requirements;
4.3 Consumer acceptance;
4.4 Future development prospects.
The results are summarized in section 4.5.

4.1. Packaging strategies

4.1.1. Packaging materials in companies: Industry (brands)

In the interviews with up to seven industrial companies, it became clear that the evaluation and selection of packaging materials is strongly oriented towards the respective framework conditions of the industry. Due to increasing vertical integration, the boundaries between industry and retail are also becoming blurred, resulting in similar strategies and requirements in some cases.

A key finding is the great importance of multi-perspectivity: different industries — such as drugstore/cosmetics, food, non-food or logistics — have very different approaches to the evaluation and selection of packaging solutions. This significantly influences which materials are considered suitable or preferred.

- **Sustainability**

On the corporate side, there is a clear tendency to opt for the most "sustainable" packaging solution. There is a great willingness to switch to fiber-based materials, particularly for small products in the fashion sector and for outer packaging in the drugstore segment. A key argument for this is the recyclability of paper and cardboard packaging. Sustainability also plays an important role beyond packaging — for example by considering the carbon footprint along the entire supply chain. A trend towards mono-materials, which are easier to recycle and process, can be identified.

- **Economic efficiency**

Despite ongoing sustainability efforts, the industry's statements indicate that economic efficiency remains the top priority. While sustainability factors are considered, economic viability continues to be the primary benchmark for decision-making.

There are economic concerns regarding the use of fiber-based packaging in areas where it is not yet widely adopted. Additionally, the strong cost pressure from the retail sector further dampens the willingness to innovate and invest.

- **Reasons for the current situation**

The current choice of packaging materials is influenced by a range of factors. While sustainability is often a priority, the approaches vary significantly. Material decisions are heavily dependent on product characteristics, particularly whether a barrier function is needed. Cost pressure is frequently cited as a barrier to investment. At the same time, many companies, especially startups, view economic success as the primary driver and adopt sustainable packaging when it aligns with financial viability.

In some cases, companies consider the requirement met if fiber-based packaging exceeds a 90% usage rate. However, the lack of cost-effective alternatives remains a significant hurdle. Additionally, the origin and procurement conditions of materials play a key role in evaluating actual sustainability. Many companies express concerns about the environmental impact of paper packaging, particularly when the raw material sources are not transparently traceable.

- **Products with limited suitability for paper packaging**

Interviews with industry representatives reveal that certain product categories are currently only partially—if at all—suitable for paper packaging. These limitations stem from product-specific requirements as well as economic and technical challenges.

- **Foodstuffs with special requirements**

A major barrier to the use of paper packaging lies in food products with unique physical properties. For example, cheese must mature and release gases during the process, while also requiring a barrier that prevents moisture or air from entering. In such cases, multi-layer packaging with specialized barriers, such as ethylene-vinyl alcohol copolymer (EVOH), is often necessary.

For meat and sausage products, protection against fat and moisture is critical to prevent the packaging from becoming saturated, hence, paper is often combined with plastic films.

Fresh products like berries or delicate vegetables also require protection from mechanical damage and moisture. Currently, paper-based materials cannot fully meet these requirements.

Liquid products, such as shower gel or hand soap, pose additional challenges. Paper does not offer the necessary barrier properties to safely contain such substances, as moisture penetration and loss of stability can occur.

- **Non-food products**

There are also clear limitations with certain non-food products. One example is stationery sets

containing erasers, rulers and pens in so-called blister packs. This packaging must be transparent, stable and efficient — properties that cannot yet be fully realized with paper-based solutions. Completely dispensing with plastic is difficult in such cases, as both visibility on the shelf and protection during transportation and storage as well as against theft must be guaranteed.

In contrast, dry products with low perishability show great potential for the use of paper-based packaging. Many items can be successfully converted here, especially if the products do not have any special barrier or stability requirements.

- **General challenges for paper packaging in industry**

Paper materials reach their technical limits due to their physical properties. They often do not offer the necessary protection for sensitive contents, which is why hybrid solutions — i.e. paper in combination with plastic or special coatings — are often used in practice. Multi-layer packaging is required to ensure the necessary protective function, especially for products with a longer shelf life.

- **Economic aspects and sustainability**

The economic feasibility of switching to paper packaging is a key challenge. The use of additional layers, bars or films often results in increased costs and complexity in production. Pure paper packaging is often not sufficient to guarantee the necessary product protection, which leads to more expensive and technically complex packaging solutions.

In addition, the additional material layering can have a negative impact on actual sustainability. In some cases, the recyclability is limited by barrier coatings, which puts the ecological advantage of paper packaging into perspective. The balance between protection, costs and sustainability is therefore a key issue in packaging development and poses challenges for the industry as well as machine and material manufacturers.

- **Advantages of paper packaging**

The industry is increasingly recognizing the advantages of paper-based packaging solutions, particularly in the areas of sustainability, recyclability, cost-effectiveness, easy handling and flexibility. Paper is considered a renewable raw material with high recyclability. In contrast to plastic recycling, the existing recycling structures for paper are well developed. Many companies rely on mono-materials such as pure paper to further improve recyclability. Lenovo, for example, uses only paper for its laptop packaging, even for the document pouches.

Another advantage of paper-based packaging is its positive economic effects and improved corporate image. Sustainable packaging solutions increase acceptance among business partners and lead to a positive customer perception. Companies that focus on sustainability often profit from a better market position. Next Level Coffee is an example of how paper-based alternatives are consistently used for machine packaging.

Simple disposal and handling also speak in favor of paper-based solutions. Paper packaging can be easily disposed of in wastepaper and is intuitive for consumers to handle. According to industry experts, paper packaging is disposed of incorrectly much less often than plastic. One concrete example is provided by Wholey, which has reduced the plastic content of its smoothie bowl packaging to such an extent that it can be completely disposed of in paper waste.

Finally, paper also offers great flexibility and versatility. It can replace numerous packaging materials — for example in machine and transport packaging. For example, Next Level Coffee uses paper barriers for coffee packaging. Paper is also easy to print on and customize, which makes it particularly attractive for industrial products. The possibility of individual design also contributes to brand profile and opens up a wide range of applications beyond the classic packaging sector.

- **Challenges with paper packaging**

The industry faces several significant challenges in the implementation of paper-based packaging solutions, which are of a technical, economic and ecological nature.

A key technical aspect is the lower resistance of paper to moisture, grease and high temperatures. Special barriers are necessary to ensure quality and shelf life, especially for packaging in the food sector. An illustrative example is the company Wholey, which still has to use plastic coatings for its smoothie bowls in order to guarantee food safety. In economic terms, paper packaging is generally more expensive than comparable plastic alternatives. The necessary switch to new packaging solutions means for Industrial companies not only face higher material costs, but also investments in adapted production facilities. For example, companies such as Hack AG use price and sales simulations to reliably assess the economic viability of packaging changes.

Further problems arise in the area of recycling and disposal. The global differences in recycling requirements make it difficult to implement sustainable strategies uniformly. Material mixes and

coatings in particular — necessary for the protection of foodstuffs, for example — significantly reduce the recyclability of paper-based packaging. As a result, companies such as Toom deliberately continue to use plastic packaging for certain products such as fertilizer, as this can be recycled more efficiently than coated paper.

These points make it clear that although paper-based solutions are an important component of sustainable packaging concepts, there are technological, economic and regulatory hurdles that require differentiated evaluation and strategic planning.

"We are seeing enormous demand from our customers — but without the right machines, even the best paper idea is worthless," commented a sales manager from a mechanical engineering company.

4.1.2. Packaging materials in companies: Trade

As part of the study, twelve companies from various sectors were interviewed on the retail side in order to obtain as broad a picture as possible of current packaging strategies. The interviewees came from food retailing (LEH) — including full-range retailers and discounters — as well as DIY stores, electronics and household goods, fashion and luxury foods. The high level of diversity among the companies surveyed makes the results very meaningful.

- **General trends in the use of packaging in retail**

Currently, many retail companies still rely on classic plastic packaging, in particular PE, PP, PET, LDPE and HDPE. These are mainly used for food and products with special protection requirements. At the same time, however, there is a clear trend towards substituting plastic with fiber-based packaging, especially for private labels and in the non-food segment. In many cases, combinations of plastic and paper are used to ensure both the necessary product protection and recyclability. Paper-based barrier materials in particular are increasingly being used, for example in packaging for coffee or other foods.

- **Sector-specific developments**

In food retail, plastic and plastic composite packaging continues to dominate, particularly for sensitive product categories such as meat and fish. However, initial transitions are being made toward paper and cardboard packaging—primarily for private-label products. Coated paper is being tested as an alternative to plastic to ensure both product protection and environmental sustainability.

In the fashion and textile industry, paper packaging has established itself as the standard for multi-piece packaging. In addition, sustainable alternatives to conventional plastic protective films are increasingly being tested here.

The DIY and home improvement sector is showing a high degree of openness towards sustainable packaging solutions. Fiber-based packaging is particularly widespread for private labels. Companies are continuously analyzing new material solutions and actively testing alternative packaging approaches. Combined materials made of paper and plastic are also used here in order to maintain a balance between protection and recyclability.

An increasing switch to mono-materials can also be observed in the electronics and household goods sector. Protective packaging made of plastic, such as thermoformed parts, is gradually being replaced by paper-based alternatives. Packaging service providers are working on further optimizing materials in order to simultaneously fulfil protective functions and sustainability criteria.

Paper-based barrier material is already being used in the coffee and luxury food category. Companies are also testing alternative materials such as sugar cane fibers as sustainable plastic substitutes. Overall, recyclable and renewable materials are also becoming increasingly important in this product group.

- **Sustainability strategies in retail — overview**

Sustainability is playing an increasingly vital role in the retail sector, particularly in relation to packaging, which contributes significantly to waste generation despite its protective function. Reducing packaging materials is a key strategy for conserving resources and lowering CO_2 emissions. As a result, retail companies are increasingly recognizing their responsibility to develop and implement sustainable packaging solutions in order to minimize their environmental impact.

Sustainability strategies in retail are driven by clearly defined objectives: a primary goal is to ensure full recyclability of all packaging materials. Additionally, retailers aim to reduce plastic usage by 30% by 2025 and promote the adoption of recycled materials—with at least 25% recycled content in packaging. There is also a strong emphasis on utilizing recyclable materials that can be produced and disposed of in an environmentally responsible manner.

To put sustainability strategies into practice, retailers are adopting a range of targeted measures. For instance, compostable plastics are increasingly being used, particularly for products with a short shelf life. Optimizing packaging design also plays a key role in reducing material usage and transport volume. Many companies are introducing sustainable procurement guidelines, which include a consistent shift toward recycled materials and FSC-certified paper. Additionally, companies are systematically recording packaging weights to analyze material usage and identify areas for reduction.

Overall, it is clear that retailers view sustainability not just as a responsibility, but also as a strategic opportunity—pursued through defined goals and actionable measures across the entire value chain.

- **Products with limited suitability for paper packaging**

From a retail perspective, it is also evident that certain product groups are currently not well-suited to paper packaging. This is primarily due to specific product requirements, technical limitations, and economic constraints.

- **Fresh foods with special requirements**

Certain fresh foods, such as grapes, strawberries, and blackberries, are still predominantly packaged in plastic, occasionally supplemented with paper bags. The main challenge lies in balancing breathability, transport safety, hygiene, and product visibility. For example, bread needs to release moisture to retain its texture—a characteristic that paper can only partially support. Similar challenges exist with items like crushed ice, which require stable and hygienic packaging. Fat-rich foods such as meat, sausages, and cheese also pose difficulties, as paper quickly absorbs fat and moisture and cannot provide reliable protection.

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- **Non-food products**

In the electronics sector, sensitive devices were traditionally packaged in polystyrene due to its high protective performance. Paper does not yet offer equivalent protection. One interviewee noted:

"Silk tissue paper is a good alternative for protecting sensitive devices during transport."

However, ensuring adequate protection for mass-market products remains a challenge. Moisture sensitivity also limits the use of paper for non-food items such as fertilizer, where plastic remains the preferred option. For products like napkins, visibility is another factor—consumers often want to see the design or color before purchase, which transparent plastic packaging allows, unlike most paper-based solutions.

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- **Challenges for paper packaging**

Paper packaging faces several notable challenges, particularly for small-format items. For example, producing candy wrappers or outer packaging for very small products using paper is nearly impossible. Paper also tends to have lower tear resistance and weaker barrier properties compared to plastic. Additionally, many retail packaging machines are specifically designed for plastic materials, making the transition to paper both technically complex and cost-intensive.

Recyclability presents another issue. To enhance product protection, many paper-based packaging solutions include plastic coatings or layers. While this improves functionality, it complicates recycling and may undermine the packaging's sustainability claims.

- **Economic aspects and sustainability**

Paper is generally more expensive than plastic and is not always the more sustainable option—especially when additional layers are needed to provide adequate protection. While consumers often perceive paper as environmentally friendly, the actual environmental impact can be higher in some cases due to more complex manufacturing processes or increased transport weights. This results in a mismatch between perceived and actual sustainability, which must be factored in when evaluating packaging alternatives.

- **Advantages of paper packaging**

Interviews with retail stakeholders highlighted four key advantages of paper-based packaging, encompassing both environmental and practical benefits:

<u>Sustainability and recyclability</u>

Paper is a renewable resource and is generally considered to have a more favorable environmental profile than plastic. Recycling systems for paper are well-established, leading to higher rates of correct disposal compared to plastic. Many retailers also favor mono-material solutions—especially pure paper—because they are easier to recycle. This not only improves recycling rates but also enhances the public perception of a company's sustainability efforts.

<u>Consumer acceptance and image</u>

Paper packaging enjoys high consumer approval and is closely associated with environmental consciousness and sustainable consumption. Surveys consistently show that consumers perceive paper solutions as more eco-friendly. This perception is supported by surveys, in which consumers consistently rate paper packaging as more sustainable. However, in practice, price often remains the decisive factor in purchasing decisions, even when sustainability is important to consumers in principle.

Easy disposal and handling

One key advantage of paper packaging is its ease of disposal. It can typically be discarded with paper waste, making it significantly simpler to handle than plastic composites. Mono-material packaging also supports correct waste separation, as it is easier for consumers to identify and sort properly. Industry experts note that paper packaging is disposed of incorrectly far less frequently than plastic alternatives.

Flexibility and versatility

Paper is highly adaptable and can replace various types of plastic packaging, including in machine-packaging applications. For example, Next Level Coffee packages both its coffee machines and coffee beans using paper-based materials with special barrier coatings. The DIY retail sector also provides successful examples: OBI and Toom have introduced paper packaging across several product categories. These cases demonstrate that paper-based packaging can be used in diverse applications and is increasingly meeting the demands of technically complex packaging requirements.

- **Challenges with paper packaging**

Despite the many advantages of paper-based solutions, practical experience has also revealed clear limitations and challenges that retailers must consider when transitioning to paper. These challenges generally fall into three categories: technical limitations, economic hurdles, and issues related to recycling and disposal.

- **Technical restrictions**

Products that come into direct contact with food — such as meat, cheese, or oily items — require effective protective barriers, which are often only achievable with plastic. A relevant example comes from the company Wholey, which continued to use a plastic coating for its smoothie bowls to comply with food safety regulations. In these cases, paper lacks sufficient resistance to moisture and grease and requires additional coatings to meet necessary barrier performance standards.

- **Economic hurdles**

Cost remains a significant challenge: paper packaging is generally more expensive than plastic alternatives. Retailers must assess whether consumers are willing to accept higher prices in exchange for increased sustainability. Additionally, converting existing production lines to accommodate paper materials often requires substantial investment. The company Wholey offers a telling example—despite its commitment to sustainability, it opted not to implement paper-based packaging for its dry products on a large scale, primarily due to cost concerns.

- **Recycling and disposal**

Practical difficulties also arise in the areas of recycling and waste disposal. While recycling infrastructure is generally well established, proper disposal does not always occur in practice. National differences in recycling standards further complicate consistent compliance. A significant issue is the use of plastic or aluminum layers in many paper-based packaging solutions to enhance protective properties. These multi-layer structures severely hinder recyclability and can contradict sustainability goals. As one interviewee summarized:

"Many consumers do not dispose of packaging properly, which disrupts the recycling cycle."

- **Conclusion for retailers**

An analysis of current developments in retail packaging clearly indicates that paper- and cardboard-based solutions already play a significant role and will continue to gain importance. In the non-food segment, and particularly for private-label products, there is a strong trend toward replacing plastic with fiber-based alternatives. This shift reflects both an evolving commitment to sustainability across the retail sector and growing consumer awareness of the environmental impact associated with traditional plastic packaging. As one retailer noted:

"Rewe has switched almost all its own-brand items to paper packaging."

At the same time, it is important to recognize that plastic remains indispensable in certain product categories — especially where specific requirements for barrier protection, hygiene, or shelf life must be met. Products that are greasy, moist, or especially sensitive currently make the widespread use of pure paper packaging either technically infeasible or economically impractical. These limitations highlight the need for product-specific evaluations when considering the use of paper-based alternatives and underscore that a one-size-fits-all solution is not yet possible.

Current findings show that many retail companies are adopting a more strategic approach to packaging. Increasingly, they are investing in the development of new materials, launching pilot projects, and systematically incorporating market feedback to continuously refine their packaging solutions. This indicates that the shift to paper packaging is no longer driven solely by ecological concerns. Instead, packaging decisions are increasingly being evaluated through a broader lens — considering sustainability, cost-efficiency, product protection, and consumer acceptance.

This trend calls for a nuanced, product-specific perspective that accounts for material properties and consumer expectations. It also underscores a critical insight: the transition to more sustainable packaging solutions can only succeed with a combination of innovation, technical feasibility, and strong collaboration across the entire value chain.

4.2. Perspectives on innovations and technological developments

Industry stakeholders identify a wide range of technological developments and innovations as key to accelerating the shift toward sustainable packaging. A major focus is on improving the recyclability of materials and building a fully functional circular economy. Advancements in recycling technology, coupled with economic incentives and regulatory frameworks, are expected to enhance the appeal and viability of recyclable packaging.

Material innovation is another critical area. Paper packaging continues to evolve to maintain recyclability while delivering improved barrier properties. This includes replacing traditional PE coatings with new barrier coatings and experimenting with alternative fiber sources such as hemp or straw. Bio-based coatings, such as bio-wax, are also viewed as promising substitutes for conventional plastic layers.

Reusable packaging systems are being piloted in additional product categories to further reduce packaging waste. On the production side, innovations are focused on optimizing printing technologies, aiming to reduce the use of inks and chemicals in paper packaging. Packaging dimensions and shapes are also being adapted to enhance transport and storage efficiency. This is echoed in industry feedback such as:

“Yes, paper packaging with improved printing is particularly interesting—specifically enhanced printing technologies that reduce ink and chemical usage.”

Despite this progress, certain product categories present persistent challenges. For example, bag-in-box solutions for cereal products remain problematic due to high functional demands. New coating solutions based on non-plastic polymers are being explored to address these issues. The concept of "paperization" — the systematic replacement of plastics with paper — is gaining traction and is increasingly seen as a viable pathway forward.

The overarching trends and conclusions can be summarized in four key findings:

Firstly, sustainability remains the primary goal, with packaging expected to be recyclable, reusable, or biodegradable.

Secondly, innovative materials with new barriers and coatings are gaining importance, as they offer the potential to replace conventional plastics.

Thirdly, political and economic incentives—such as regulations and subsidy programs—are helping to drive innovation.

Fourthly, efforts in production and transport are focused on increasing efficiency, reducing material usage, and optimizing processes.

The interviews make it clear that retailers are prioritizing sustainable materials and innovative technological developments in packaging to align ecological and economic objectives. A key area of innovation is the development of sustainable packaging materials. Packaging must be fully recyclable, reusable, or biodegradable. This includes replacing fossil-based plastics with biodegradable alternatives, using grass paper and recycled fibers, and reducing material thickness—for example, through thinner plastic films. New materials such as silphia are also viewed as promising, though currently still too expensive for the mass market.

A second area of focus lies in technological innovations in packaging management. AI-supported tools aim to optimize packaging design and improve recyclability. Smart packaging with integrated sensors can display information such as remaining shelf life, helping to reduce food waste. Alternatives to conventional labeling, such as laser engraving or direct printing on the product, were also mentioned by interviewees as particularly relevant.

In terms of communication, digital solutions are gaining importance. QR codes and NFC tags can provide consumers with additional information, such as product ingredients or recycling instructions. Digital solutions may also replace legally required information, allowing for cleaner, more flexible packaging design.

Another innovation path focuses on packaging reduction and the introduction of reusable systems. Unnecessary packaging should be avoided, while reusable solutions should only be implemented when they make ecological and economic sense. Concepts like bring-your-own containers for food are increasingly seen as future-oriented models.

Finally, retailers are placing greater emphasis on improving efficiency and reducing costs. Packaging sizes should be tailored to actual needs, and transport volumes minimized. Higher production volumes of sustainable packaging are viewed as an opportunity to reduce costs and improve competitiveness.

Overall, it is clear that retailers are pursuing a wide range of innovations, both in terms of materials and technology. The goal is to harmonize sustainability, functionality, and cost-effectiveness, thereby contributing actively to ecological transformation in the packaging industry.

4.3. Regulatory influences

Almost all interviewees emphasized the significant impact of the European Packaging Ordinance (PPWR). The requirements for recyclability and the use of recycled content are seen as particularly critical. Plastic packaging often fails to meet these standards due to insufficient sorting and recycling processes, while paper-based solutions are frequently viewed as inherently more favorable—even though they are not always actually recycled more effectively.

There is a repeated call for more uniform definitions, binding recycling symbols, and financial incentives (e.g., modulated license fees). Companies are seeking greater transparency and practicality in regulation to enable more reliable planning.

"The pressure is increasing, but the rules are not clear enough. We need more binding rules on what is considered recyclable," says a packaging developer from the food industry.

- **Regulatory requirements in the industry**

Regulatory requirements are becoming increasingly significant, especially in light of new and stricter EU regulations. These not only affect standards in the packaging sector but also create uncertainty in the market. A key example is the new EU packaging regulation, which sets higher targets for the recycled content of packaging. Additionally, the EUDR (EU Deforestation Regulation) requires companies to provide detailed proof of the origin of fibers and other raw materials used throughout the supply chain.

Alongside EU directives, the varying national regulations within the EU make it especially difficult to implement sustainable packaging solutions uniformly. Different rules, substance bans, and recycling quotas in individual countries complicate efforts by internationally active companies to establish standardized and economically viable packaging strategies. As a result, companies often have to operate multiple packaging systems in parallel, which is both logistically and financially demanding.

The overarching conclusion is that European regulation is intensifying, thereby increasing the pressure on companies to take action. At the same time, it introduces uncertainties that complicate national-level adjustments. Rising recycling quotas and stricter material requirements present complex technical and economic challenges for the industry. While political measures could help support this transformation, there is currently a lack of sufficiently concrete support mechanisms. Disparate national legislation hinders consistent implementation, and economic barriers—such as the higher costs of sustainable packaging—further complicate the shift for many companies. Clear, coordinated regulation and financial support are needed to help embed sustainable packaging solutions more broadly across the industry.

- **Regulatory requirements in the retail sector**

Regulatory requirements in the retail sector compel companies to strike a delicate balance between legal compliance and meeting customer expectations regarding quality and sustainability. This is particularly challenging in the private label segment, where legal adherence, product protection, and economic efficiency must all be considered simultaneously.

Practical implementation is complex: while direct prohibitions may not always exist, the regulatory requirements are often intricate and open to interpretation. Retail companies are therefore tasked with developing packaging solutions that satisfy both legal requirements and economic constraints. This is evident, for example, in the case of coated paper packaging—depending on the type and amount of coating, recyclability can vary significantly.

In practice, this means companies must not only stay up to date with evolving legal frameworks but also continuously reassess and optimize the technical and economic aspects of their packaging in order to remain both competitive and sustainable.

4.4. Consumer acceptance

The majority of companies surveyed confirmed that consumers generally view paper-based packaging positively. Particularly in categories such as dry goods, snacks, hygiene items, and household products, the paper look is strongly associated with environmental friendliness.

However, according to interviewees, a gap exists between perception and reality: many consumers are unable to correctly identify or dispose of sustainable packaging. In this context, the need for clearer communication and design—such as through pictograms or QR codes to guide disposal—was mentioned repeatedly. One retailer put it this way:

"People want eco — but don't know whether the brown bag now belongs in the waste paper or in the residual waste."

Some retailers reported pilot formats in which customers were invited to leave specific comments on packaging, with high levels of participation. In some cases, this feedback directly informed new development cycles.

4.5. Development prospects

When asked about the role of paper-based packaging in 2030, almost all interviewees said it would increase significantly. Some referred to it as a “new standard” for simple applications, while others mentioned hybrid solutions for more complex products.

According to several experts, it is crucial that sustainability does not compromise product safety, logistical performance, or brand impact. The challenge in the coming years will be to strike an intelligent balance between functionality, cost-efficiency, and sustainable messaging.

The role of machine suppliers, such as Heidelberger Druckmaschinen AG, is seen as essential: large-scale paperization can only succeed if printing, finishing, and packaging processes are precisely aligned with the new materials.

“If we want to scale up, we need partners who think about the technical implementation from the beginning — not just during series production,” says a packaging strategist from a branded goods manufacturer.

4.6. Key findings from the expert interviews

The expert interviews clearly show that paper packaging is becoming increasingly important in corporate strategies — particularly in response to regulatory pressures and growing sustainability demands. While some industries already rely consistently on fiber-based solutions, plastics remain the preferred packaging material in other sectors. The choice of materials depends heavily on practical feasibility and the specific requirements for barrier properties. For example, plastic packaging continues to dominate in the case of perishable foods, which require a high level of protection.

The implementation of the new EU packaging regulation (PPWR) has already prompted initial action in many companies. However, there remains considerable uncertainty about the exact legal requirements. Some companies are already investing in recycling and closed-loop strategies, while others are holding back, awaiting greater clarity and legal certainty before moving forward.

In this context, technological developments are gaining attention. Companies are working on improved barrier coatings for paper packaging and on innovative recycling solutions. Experiments with bio-based polymers and barrier coatings are also underway.

Still, the transition to paper packaging presents several challenges. Technically, achieving sufficient barrier protection against moisture, grease, and oxygen is particularly difficult. In addition, existing packaging lines are often not designed for paper, necessitating costly investments in new machinery. Recycling also remains a critical issue: while paper packaging is generally easy to recycle, there is a lack of standardized specifications and limited consumer awareness regarding correct disposal. This complicates efforts to use paper packaging efficiently within a circular economy framework.

Another obstacle is the fragmented legal landscape in Europe. Varying national requirements and unclear details of the PPWR hinder the swift implementation of sustainable solutions. Companies are calling for standardized guidelines and economic incentives to make investments in sustainable packaging more predictable.

The marketability of sustainable packaging is also not always guaranteed. While paper solutions are generally viewed positively by consumers, concerns remain regarding functionality, durability, and cost. Companies report skepticism among retailers, especially when new packaging appears to compromise product quality. As a result, expectations are also directed at packaging manufacturers: they are expected to deliver materials that are not only sustainable, but also machine-compatible, economically viable, and recyclable.

Overall, a clear future trend is emerging: the packaging of the future will be guided by the principles of the circular economy. Smart solutions featuring QR codes, technological advances in recycling, and the use of resource-efficient materials will play key roles. Reusable systems may also gain significance, at least in certain product segments.

5. Recommendations for action

For industry (brands):

- Address regulatory requirements early and develop binding conversion roadmaps for critical packaging lines.
- Make targeted investments in innovative packaging solutions that combine sustainability with product protection—especially for primary packaging.
- Use pilot projects with selected retailers to test new paper packaging on the market and gather valuable feedback.
- Involve technical partners (e.g., machine manufacturers) early in the development process to ensure industrial feasibility.
- Develop communication strategies that highlight ecological packaging solutions and strengthen the brand.

For retailers:

- Establish clear guidelines for packaging conversion in private label lines—especially where consumers are receptive to paper-based solutions.
- Develop POS concepts and labeling systems that make sustainability visible and easy to understand (e.g., simple recycling symbols, traffic light systems).
- Systematically use consumer feedback to further refine packaging, e.g., through integrated feedback tools.
- Promote close collaboration with brand manufacturers and suppliers to scale sustainable solutions together.
- Actively communicate packaging transition successes — both in the marketplace and to stakeholders — to demonstrate a leadership role.

6. Conclusion

The aim of this study was to highlight key developments and requirements related to paper-based packaging in 2030. Based on the relevance of the topic and the evolving regulatory framework, practical insights were gathered and analyzed from the perspectives of both retailers and brand manufacturers.

The research questions formulated at the outset can be answered as follows:

Which packaging trends and innovations are particularly relevant? → → The focus is clearly on *paperization*. Mono-paper solutions with barrier coatings and hybrid paper composites that meet functional requirements are especially important. Innovation capacity strongly depends on collaboration among developers, producers, and machine manufacturers.

What functional and legal requirements must be met? → Core requirements include recyclability, product protection, machine compatibility, and clear communication. The PPWR creates political pressure to act, but operational clarity is still lacking. Companies require reliable, harmonized standards.

In which areas can plastic be replaced? → The greatest potential lies in dry goods, hygiene products, and non-food items. For chilled, fatty, or highly sensitive products, full substitution is not yet technically or economically feasible.

How do effort and costs relate to sustainability? → Total cost of ownership rises in the short to medium term due to transition costs, technical adjustments, and development demands. Over the long term, companies anticipate benefits from improved brand image, market positioning, and regulatory advantages.

What do companies expect from packaging partners? → Companies are looking for partners who go beyond off-the-shelf solutions and actively engage in the development process. Key qualities include machine compatibility, flexibility, innovation expertise, and transparency throughout the project.

Methodologically, the study is based on 21 qualitative interviews with decision-makers from the retail and manufacturing sectors. Evaluation followed the principles of qualitative content analysis, combining deductive and inductive category development. Systematic coding allowed the identification of both industry-specific differences and overarching trends.

In summary, it can be stated that paper-based packaging has the potential to play a leading role by 2030 — *if* technological challenges are addressed, regulatory clarity is achieved, and consumers are systematically engaged. This transformation can only succeed through collaboration across the entire value chain—from material developers and machine manufacturers to brands and retailers.

7. Outlook

Despite noticeable progress, key questions remain unanswered — questions that future research and corporate practice should address. The following development areas should be prioritized to ensure the sustainable market penetration of paper-based packaging:

- Material innovation: Which new paper composites or coatings can fully replace the barrier functions of plastic in the future without compromising recyclability?
- Scalability and cost-effectiveness: How can sustainable packaging solutions be efficiently scaled on an industrial level while remaining affordable — especially for SMEs?
- Consumer communication: How can consumer knowledge and behavior around disposal, recyclability, and sustainability be improved and communicated in a standardized way?
- Digitalization and packaging: To what extent can digital technologies (e.g., QR codes, blockchain, smart packaging) help increase transparency and traceability in packaging?

Next steps for implementation:

- Cross-industry pilot projects: Retailers, brands and machine manufacturers should jointly develop, test and publicly document use cases.
- Investment in research networks: Public and private research funding should specifically promote material and machine development projects.
- Create standards: The industry should commit to uniform, practical and comprehensible packaging standards.
- Intensify stakeholder communication: Policymakers, associations, and companies must collaborate systematically to make regulations marketable and innovation friendly.
- Paper-based packaging is on the threshold of industrialization. The will to transform is clear — now it is time to work together to create the structural conditions for a sustainable packaging future.

The following students from the HD22B13 course contributed to the study:

Figure 4: Students visiting Heidelberger Druckmaschinen AG at the start of the program

Louis Baumgarten	Benedict Kühn
Lucas Bayer	Sophia Malik
Moritz Böckmann	Tobias Mergner
Jannik Brüdigam	Boram Park
Moritz Fessner	Johannes Richter
Volker Grassl	Tim Roche
Moritz Gressard	Bartosz Slomkowski
Luisa Höfling-Conradi	Kevin Sebastian Tanz
Anna-Lena Hoppe	Ewa Tietze
Lennard Kirchhoff	Leo Weiß
Michelle Koelbel	Josephine Windermut
Lewis Krasz	

Bibliography

Alhamdi, F. (2020): Role of packaging in consumer buying behavior. Management Science Letters, Vol. 10, Nr. 6, S. 1191-1196.

Europäische Kommission (2022): Vorschlag für eine Verordnung über Verpackungen und Verpackungsabfälle sowie zur Änderung der Verordnung (EU) 2019/1020 und zur Aufhebung der Richtlinie 94/62/EG über Verpackungen und Verpackungsabfälle.

EY Future Consumer Index (2023): Nachhaltigkeit im Wandel der Konsumwelt.

GfK (2022): Nachhaltigkeit im Konsumverhalten.

Ipsos (2022): Nachhaltige Verpackung – was Kunden wirklich wollen.

Lebensmittelzeitung (2025): Für Händler und Hersteller ist Nachhaltigkeit weiterhin wichtig. Sie sehen aber hohe Kosten als Problem. Die wichtigsten Ergebnisse einer Studie des Zentrums für nachhaltige Unternehmensführung und der LZ. Online: https://www.lebensmittelzeitung.net/handel/nachrichten/branchenanalyse-von-znu-und-lz-viele-unternehmen-setzen-nachhaltigkeit-noch-nicht-systematisch-um-184042, last query: 5/8/2025.

Lidl (2024): bewusst machen – Nachhaltigskeitsbericht Lidl in Deutschland Geschäftsjahre 2022 und 2023, Online unter: https://unternehmen.lidl.de/pdf/show/102979, last query: 5/9/2025.

Mayring, P. (2015): Qualitative content analysis: Theoretical background and procedures. Approaches to qualitative research in mathematics education: Examples of methodology and methods, S. 365-380.

McKinsey (2023): The Future of Sustainable Packaging.

Pro Carton (2010): Die Einstellung von Konsumenten zu Verpackung und Nachhaltigkeit: Zusammenfassung einer Studie von GfK im Auftrag von Pro Carton

Rokka, J. & Uusitalo, L. (2008): Preference for Green Packaging in Consumer Product Choices, International Journal of Consumer Studies, Vol.32, Nr. 5, S.516-525.

Smithers Pira (2022): The Paper-Based Packaging Market to 2027.

UBA (2022): Verpackungsmüll in Deutschland, Umweltbundesamt.

Wunderlich, S. et al. (2021): Recyclingverständnis und Verpackungsdesign, Universität Hohenheim.

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DHBW Heilbronn is the youngest member of the Baden-Württemberg Cooperative State University. Founded in 2010, it has become a leading institution for the food industry, offering a unique range of programs. Currently, over 1,600 students are enrolled in Retail Management (B.A.), Service Management (B.A.), Food Management (B.A.), Digital Commerce Management (B.A.), Business Informatics (B.Sc.), Data Science and Artificial Intelligence, Smart Operations Management (B.Sc.), Business Administration – Technical Management/Recyclable Material & Recycling Management (B.A.), and Wine – Technology – Management (B.Sc.) in cooperation with LVWO Weinsberg.

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