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REQUIREMENTS FOR A SHIFT TO SUSTAINABLE FOOD PACKAGING - A COMPANY APPROACH

Abstract: The accumulation of huge amounts of plastic waste is causing irreversible damage to nature and human health, and one solution could be to apply the principles of the circular economy. A number of global and European regulations (Sustainable Development Goals, Green Deal) address this issue and aim to apply the circular economy model. However, the practical implementation of the targets in the context of food packaging is also very slow and the decision to influence the process is in the hands of companies. The views of corporate decision-makers in this area are particularly important in the food industry, as these companies either produce the packaging themselves and/or decide which packaging to use. The literature identifies some of the factors influencing business decisions (customer expectations, costs). The aim of this study is to present, analyse and discuss the factors that influence domestic manufacturers in their choice of packaging materials. We conducted semi-structured in-depth interviews with decision-makers from various domestic food and food packaging companies, which were analysed using the Berkana two-loop model. Our results show the current practices and the perceived reasons and options for adopting or not adopting the new system. In conclusion, the study shows that theories and goals for reducing environmental impact are only developed when they are translated into everyday practice. In the case of food packaging, alternatives already exist, but it is easier and simpler for decision makers to maintain the status quo.

Keywords: Food packaging, Packaging materials, Circular Economy, Company approach

1. INTRODUCTION

Plastic pollution is a major problem today, with many negative impacts. The widespread use of plastics, their long degradation time and single-use type, often causes irreversible damage to the environment. In the coming decades, pollution is expected to increase exponentially due to rising consumption, high production rates and slow degradation times. Plastic waste in landfills and in the natural environment also damages soils and waters, with impacts on wildlife and human health. However, it is not only end-of-life treatment or lack thereof, but also the manufacturing stages that contribute significantly to adverse impacts (Jagoda et al., 2023). Overall, the United States has the highest per capita plastic waste generation (approximately 130 kg per capita) among all nations (Chapman et al, 2024). Plastic post-consumer externalities have significant economic costs, energy-intensive plastic incineration and manufacturing processes contribute to climate change, and plastic production consumes 6% of global oil production (Kleine Jäger & Piscicelli, 2021). The packaging industry accounts for about 40% of plastic production. Packaging is increasingly seen as a major issue in today's societies. It represents a significant waste stream, accounting for 30-35% of municipal waste in

industrialised countries and 15-20% in developing countries. The shutdown of the waste management markets in China and India (2018 and 2019) has posed challenges for most countries exporting recyclables. The need to address the challenges posed by packaging waste has prompted companies and governments to examine the environmental impact of packaging (Afif et al, 2022). Japan has a very high per capita plastic packaging waste (32.4 kg), second only to the US, but ahead of China and the European Union (EU). Japan has a high collection and recycling rate for beverage bottles (93%), but most plastics are not managed in a sustainable way (Chapman et al., 2024). The packaging industry is growing at an unprecedented rate. It is forecast to reach USD 320.94 billion in the coming years, while the sector's annual growth rate will remain at 4%. The packaging industry has one of the highest waste rates of many other sectors. In the EU, the amount of waste generated by the packaging industry has increased from 163 kg to 170 kg per capita over the last decade (Ada et al., 2023). Food packaging plays a critical role in the sustainability of the global food distribution system. In a globalising world and changing consumer demands, the application of the Circular Economy (CE) in food packaging processes has become an issue that needs to be addressed (Kazancoglu et al., 2023). In order to reduce waste generation in the packaging sector, the European Commission (EC) is implementing policies and practices that facilitate the transition to the CE model (Ada et al, 2023). The transition from a linear economy to a CE model is essential, with packaging made using appropriate packaging materials as an important step (Kazancoglu et al., 2023). The role of education at all levels of the food packaging value chain, as well as the development of sustainable materials and new technologies, have all been identified as cost-effective and green approaches to minimise plastic waste. However, it is not clear which would be the most effective way to achieve a rapid transition to a circular, sustainable system. Many factors need to be taken into account to significantly reduce the demand for single-use, petroleum-based plastic products. Although the impact of plastics on climate change is a general concern, a small percentage of policy makers, companies and consumers are actually engaged in prevention activities (Trubetskaya et al., 2022). The food packaging industry is under pressure to adopt more sustainable practices, in which CE plays an important role. The food packaging industry is in a special position in the context of CE due to the health and safety concerns related to food, high complexity and high dependence on single-use packaging (Nielsen & Hakala, 2023). The current socio-economic system is based on a one-way linear economic model, where consumers dispose of packaging after use. This results in a loss of resources at several points. Today, the transition to a circular economy is ongoing. In this transition period, a complete transformation cannot be achieved in the short term. In this area, the whole system needs to be considered (Kazancoglu et al., 2023).

2. THEORETICAL FRAMEWORK

2.1. Circular Economy

The circular economy is defined as an economic system based on business models that replace the end-of-life concept with the reduction, alternative reuse and recycling of materials in production, distribution and consumption processes. As a regenerative system, CE aims to slow down, close and narrow material and energy cycles (Kleine Jäger & Piscicelli, 2021). CE incorporates the aspect of maximum utility and value into its design structure. It includes a closed loop of material flows and energy and raw materials through different phases. In the concept, finished products and material inputs circulate for as long as possible (Ada et al, 2023). Circular packaging solutions include the redesign of packaging formats and delivery models, the introduction of reusable packaging, and improvements in the economy and quality of recycled plastics (Kleine Jäger & Piscicelli, 2021). Many current food packaging practices are not in line with circular and sustainable supply chains, as they were developed when safety, convenience, affordability and food security were the primary goals. The transition to new solutions poses systemic challenges such as ineffective communication between stakeholders, misconceptions, broad and confusing definitions, imbalances in plastic supply and demand, legislative influences and top-down policies. There is also a need to review food packaging from environmental, social, technological and economic perspectives (Trubetskaya et al., 2022). From a spatial perspective, CE is a widely held idea and the circular economy model agenda is pushing for change based on stricter regulations at national and global levels. While European countries are perhaps at the forefront of the move towards circularity, with most Member States having developed policy agendas to promote circularity, the CE concept is also widespread outside the EU (Nielsen & Hakala, 2023).

2.2. Regulations and policies

Consumers in developed countries are pressing for increased safety, accountability and ever more sustainability in food production. The EU has established a legislative framework to reduce waste and protect consumers. In addition to formal policy regulations, citizen-centred solutions such as the concept of CE have emerged. In order to encourage companies to adopt such environmental practices, governments in most developed countries have launched upstream incentive-based instruments such as packaging taxes. These provide strong incentives for firms to make optimal packaging decisions in terms of volume, weight and materials. Packaging taxes are price-based policy regulations that provide economic incentives for producers to engage in less environmentally damaging practices. Tax rates vary according to the life-cycle impacts of packaging materials. In other words, the packaging tax reflects the environmental harms associated with the production of packaging materials as well as the social costs of their final disposal. This instrument, in the form of weight-

based charges, encourages manufacturers to choose more environmentally friendly packaging materials (Afif et al., 2022). This has led many stakeholders to take action to reduce the negative environmental impacts of food packaging throughout its life cycle. For example, legislators have introduced legislation to increase the recycling of plastics. In particular, extended producer responsibility (EPR) legislation has led to increased recycling rates in many countries. Bans on single-use plastics have put additional regulatory pressure on producers in several countries and regions (Herbes et al., 2024). EPR is a policy approach in which the physical and/or financial responsibility of the producer for the product is extended to the post-consumer stage. It is based on the 'polluter pays' principle, which means that producers contribute financially to waste management. When applied to packaging, the EPR places the responsibility for the packaging life-cycle on the producer and not on the governments. EPR provides strong incentives for companies to make optimal packaging decisions in terms of volume, weight and materials. The aim of the EPR policy is not only to relieve municipalities of part of the financial burden of waste management, but more importantly to encourage packaging producers to reduce resources, use more secondary materials instead of primary materials and design products to reduce packaging waste. EPR policies mean that both manufacturers and retailers are forced to internalise costs that were previously passed on to society, but also have a way to reduce costs and avoid potential environmental penalties or fines (Afif et al., 2022). EU policy makers aim to reduce the volume and environmental impact of certain plastic products through the Single-Use Plastics Directive (2019/904). Member States have committed to introduce more stringent regulatory measures by 2030. Integrating sustainability into the management of plastic production and use involves the systematic integration of technological, socio-psychological, environmental, political and other dimensions from micro to macro levels. Stakeholder perspectives on mitigation strategies to reduce plastic food packaging material will be crucial to support and promote the development of new strategies and to identify innovative ideas to reduce plastic pollution. However, the Directive defines all synthetic polymers and chemically modified natural polymers as plastics. Thus, all manufactured food packaging containing these polymers is covered by the Directive, without exceptions or minimum threshold values. Currently, a broad definition of plastic packaging can be a barrier to the production of safe and shelf-stable food (Trubetskaya et al., 2022). The need to reduce packaging waste generation is addressed in several EU legislation and strategy documents; moreover, the priority of waste reduction over end-of-life management is emphasised. For example, the European Green Deal (Fetting, 2020), the Circular Economy Action Plan and, in particular, the Packaging and Packaging Waste legislation (94/62/EC) currently under review, which would set direct recycling targets. The EU waste hierarchy prioritises reuse over recycling. Due to changes in the operating environment, including consumer demands, the importance of reusable packaging is increasingly recognised and widely applied at the business-to-business (B2B) level, such as in transport packaging, but to a limited extent in business-to-consumer (B2C), such as in retail environments (Tenhunen-Lunkka et al., 2024, Weinrich et al., 2024). Regardless of whether consumers are indeed willing to pay more for recycling, perceived changes in consumer values have influenced legislative action. In addition, many large companies in the food industry (e.g. Nestlé, PepsiCo, Mars, The Coca-Cola Company and Danone) have committed to making their packaging fully recyclable (Nielsen & Hakala, 2023). From an industry perspective, many companies have published their development goals under the UN Global Principles Agreement in the context of sustainability, and are evaluating their existing product structures and promoting models for developing new packaging solutions, mainly in line with their goals for the next 10-15 years (Kazancoglu et al, 2023). The use of recycled and bio-based materials not only meets sustainability goals, but also increases supply chain flexibility by diversifying material sources and reducing dependence on fossil fuels. Understanding these motivations provides critical insights to guide policy development, industry practices, and research efforts aimed at promoting sustainable and responsible material choices in manufacturing processes (Chapman et al., 2024). However, policies pushing for recyclability and reusability of packaging materials have created an industry response that favors simpler, single-material packaging (Nielsen & Hakala, 2023).

2.3. Barrier factors

Manufacturers face various obstacles in dealing with packaging problems. From an environmental perspective, five challenges emerge in the literature. In some cases, the CE principles cannot be properly applied to multi-layer materials, existing environmental legislation, contamination. Non-recyclable materials, such as black plastic, are another environmental barrier. Land use change, toxicity and other factors can have negative impacts on biodiversity or production activities. An additional challenge is that packaging is a low priority compared to operational considerations such as labour and material costs (Ada et al., 2023). A number of factors have been identified in the literature that influence the choice of packaging material. According to Kazancoglu et al., (2023), the choice of packaging material depends on the type of product to be packaged, its chemical and physical properties, the desired packaging life, customer expectations, cost, and other specific factors. Weinrich et al., (2024) broke it down into external and internal influencing factors and found the following: internal factors described as lack of management and employee commitment, resistance to change in packaging and packaging development processes, cost of materials, equipment and training, internal problems in interdepartmental interaction, complexity of decision making processes, lack of knowledge/training/experience, lack of tools and approaches for sustainable packaging design. External influencing factors identified were loss of competitiveness, customer resistance, unfavourable legislation and problems with packaging suppliers. Afif et al, (2022) consider that the price of packaging materials is an important decision factor in raw material procurement. They mention that decision makers are only willing to accept environmentally friendly packaging alternatives if the costs are reasonable. This is because manufacturers are predominantly driven by a cost-cutting approach. Companies will only accept

environmental packaging alternatives if they offer economic benefits such as increased efficiency and cost reduction. Similarly, it appears that reducing packaging at source is sensitive to changes in packaging material prices. According to Chapman et al, (2024), consumer preferences and demand for sustainable products drive manufacturing strategies. Increasing consumer preference for environmentally friendly products is forcing manufacturers to adapt their practices accordingly. Consumer demand for green products is therefore a powerful motivator for manufacturers. Jagoda et al., (2023) found a change in the influencing factors. The parameters considered in the design of sustainability decision making have evolved over the past decades based on market needs and socio-technical dynamics. Although cost and functional criteria dominated design decisions a few decades ago, environmental sustainability has become an important consideration as awareness of environmental consequences has grown. However, the concern for functional and financial aspects is significant from a stakeholder perspective. However, Keränen et al, (2021) also draw attention to disincentives. The value network for plastic food packaging is affected by the maturity of established and well-established technology and related business processes, which may hinder the shift towards more sustainable packaging. Past investments in machinery, manufacturing know-how, processes and relationships may further reduce the interest of established industry players, in particular plastic material suppliers, in new investments. As some plastics companies are also chemical companies, they are usually large and well known, with a strong position in the network. If these companies do not want to take the economic risk of introducing new materials, especially in the early stages, or if they are linked to the oil industry through ownership, they are strong enough not to make changes without strong technological and economic advantages. Indeed, sustainable innovations are often created in complex cross-sectoral networks and their development requires cooperation between different stakeholders, such as regulators and other companies. However, while recognising the important role of regulatory measures, the success or failure of the transition to sustainable packaging also depends on the behaviour of market actors. If companies do not produce and offer sustainable packaging, or if consumers do not buy it, change will not happen. Decision-making processes on packaging in food companies are often not well structured; companies tend to wait and see on sustainable packaging. In any case, it should be clear that assuming that sustainable packaging is a low priority for consumers who will not pay for it is enough of a barrier in managerial thinking to preclude even thinking about redesigning for sustainable packaging (Herbes et al., 2024). However, awareness of changes in production innovation, technology, information technology and communication can contribute to the creation and implementation of sustainable food packaging (Trojanowski, 2023). Nielsen & Hakala (2023) note that many companies are reluctant to switch to environmentally friendly materials and are often reluctant to go beyond a CE approach based on recycling, especially if it requires more resources.

3. MATERIAL AND METHODS

Semi-structured in-depth interviews were conducted with decision-makers from domestic food manufacturing companies (3) and a food packaging company (1). Interviews were conducted between August and December 2024 and lasted between 40-90 minutes. The companies are food and food packaging manufacturers in the SME sector, producing different types of food. The interviewees include companies producing confectionery, canned food, dairy products and vegetable packaging. Two interviews were conducted face-to-face, one on a Webex meeting platform and one with a written response. To analyse the interviews, the Berkana two-round model was used, which is suitable for identifying problems, exploring solutions, and design thinking. This tool is unique because it provides an opportunity to consider not only technical issues, but to combine all aspects of sustainable food packaging, including socio-economic, technical and public thinking. Berkana's two-loop model has identified a roadmap for change from initial challenge to potential solution. The goal is to create a sustainable packaging system that fully integrates policies and systems, technology, environment, mindsets and behaviours, initiatives and outliers (Berry, 2022). Some of the questions that were asked during the interviews and that were ultimately used for the analysis are illustrated in Table 1.

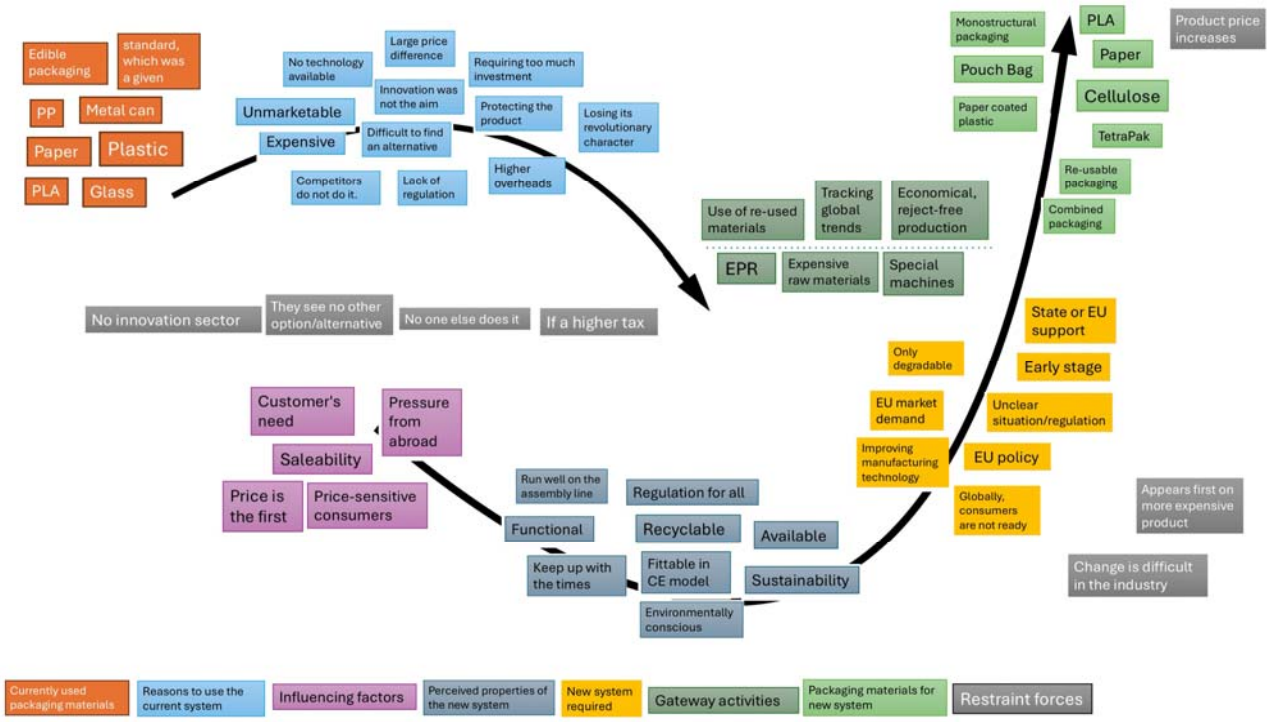
Table 1: The questions used

What packaging material is used?
Have you used alternative packaging materials?
Do you have any long-term plans to switch to alternative packaging materials?
Does the company have producer responsibility in place?
What measures are being taken to improve end-of-life management of packaging?
What criteria are used to select the packaging material used?
What do you think will be the trends in packaging materials in the future?
What changes might come in terms of production and raw materials?
What are the regulations that guide you in choosing the packaging material you use?

Source: Own editing

4. RESULT AND DISCUSSION

After analysing the interviews, we applied the Berkana two-loop model to explore the reasons that led to the current system and how interviewees envision the new system. The current system is the packaging system that companies use, with the usual packaging materials. And the new system is the one we have developed in the second loop based on the opinions of the interviewees. It is the system in which the circular economy can be achieved in a sustainable and environmentally friendly way. Figure 1 illustrates the resulting model.



Picture 1: The model of the old and the new system
Source: Edited by the authors based on their own research

Starting from the top left corner of the figure, you can see the first loop, the current system. The starting point is the packaging materials currently in use (orange text box). Moving further along the loop, we can see the reasons why the companies surveyed use this system (blue text box). The starting point for the second loop starts with the factors that could trigger companies to develop a new system (purple text box). Moving on from this, we can see the perceived characteristics of the new system (grey-blue text box). Turning towards the top, we have illustrated the factors that are necessary to create the new system (yellow text box). At the apex of the new system, we can see the packaging and packaging materials that the interviewees consider to be a new alternative (light green text box). Between the two loops, there is a possibility for a transition to the new system through the use of transition activities by companies using the current system (dark green text box). However, during the interviews, we heard about disincentives that may occur at different stages (grey text box).

The results show that the current use of packaging materials in the food market is still very diverse. Plastic is almost ubiquitous, alongside paper, glass, metal cans and polypropylene (PP). There were some respondents who said they used the standard that was given when they started their business. However, alternatives such as polylactic acid (PLA) or edible packaging are also present. The following barriers to switching to alternatives were identified by respondents: not marketable, expensive, no technology, large price difference, competitors not doing it, difficult to find alternatives, lack of regulation, too high investment, higher overheads. These are identified as reasons for operating under the current system, which are complemented by the fact that they are concerned about product protection, there was no aim to innovate, and biodegradable packaging is losing its revolutionary nature in their view. Afif et al, (2022) find similar results, with the price sensitivity of alternative packaging materials and high investment costs being defined as a deterrent. The following influencing factors were identified during the in-depth interviews: customer needs, price, price-sensitive consumers, saleability and international pressure. In their study, Nielsen & Hakala (2023) conclude that the main drivers for CE adoption are energy savings, environmental protection, financial incentives and tax incentives, but in contrast to our results, consumer demand and regulatory pressure are considered less important. Profitability, market share and economic incentives were also mentioned. A survey by Herbes et al, (2024) reveals that the companies surveyed perceive that consumers are not interested in packaging and the sustainability of packaging. This implies that there is a communication gap where information may be misleadingly flowing, our findings showed that consumer demand is given.

In their research, they conducted a survey representative of the SME sector and concluded that, based on their perception, companies are not able to take the initiative to switch to more sustainable packaging. Weinrich et al., (2024) identified the following criteria: product quality, availability of resources and packaging, shelf life, packaging with appropriate design and deliverability. In addition, they noted that cost is more important in decision making, such as the variable cost of alternative packaging, the fixed cost of investing in new equipment. Based on the interviews, the new system should have the following characteristics: it should be functional, run well on existing lines (so as not to require new investments), be recyclable, sustainable, environmentally friendly and fit into the CE model, and be accessible to all. This requires comprehensive regulation that applies to all. Keränen et al, (2021) are in line with their conclusions, in their research they also found that at the macro level, the policy framework and increasing consumer demand can put pressure on firms to recognise the potential of sustainable innovation at the firm level. In food packaging, large players are strong enough to stick with existing technologies if there are no external drivers to adopt sustainable packaging innovations. In addition to regulations and incentives, education on sustainability can provide an important framework for companies to do business, while raising consumer awareness. Likewise, politicians and consumers can push and encourage firms to make sustainable choices; however, as firms are actors in the value network, macro-level pressures are also transmitted to the network level. Respondents also identified the necessary conditions for the new system to work. They require improvements in production technology, public or EU support. The issues that need to be addressed to make it work: regulation at EU level, global consumers are not yet ready to use and handle alternative packaging, the situation and regulations for these materials need to be clarified, it is still at a very early stage, there is only EU market demand for it. Trubetskaya et al., (2022) and Ada et al., (2023) in their results concur that they see the new system as feasible through consumer education, training of professionals and value chain actors, and government support. They note that the lack of price competitiveness for sustainable materials is too great to be overcome at present and cannot be overcome by government incentives. They believe that the integration and harmonisation of new technologies, materials and processes should be promoted across Europe. We also looked at how manufacturers could envisage alternative materials in this new system. PLA, paper, cellulose, Tetra Pak, as well as Pouch Bag, paper coated plastic, mono, reusable and composite packaging have all been introduced.

It is possible to move from the current system as a bridge/tunnel to the new system by using recycled materials, monitoring global trends, economical and scrap-free production, EPR, special machinery and the introduction of alternative raw materials that are considered expensive. Keränen et al., (2021) also confirm that the transition requires new resources, value-adding activities and cooperation between actors. Jagoda et al., (2023) in their study on EPR systems suggest that national policies could be introduced to organise End-of-Life (EoL) treatment facilities with financial support from the manufacturer, which would encourage the manufacturer to shift towards less environmentally damaging designs. Ada et al., (2023) and Herbes et al., (2024) also draw attention to the legal constraints. Current environmental laws and regulations are complex and contradictory in many areas and are not aligned with CE principles. Waste management and regulatory issues are expected to worsen due to inadequate legislation, despite growing awareness of the long-term impact of global plastic pollution. Legislation alone will not encourage companies to adopt CE practices. CE principles, sustainability and greening should be able to overcome this problem through regulation and be able to adapt to upcoming innovations that may be needed. They mention in their study that in interviews they have conducted, it is repeatedly mentioned that government does not provide sufficient incentives to reduce packaging waste. They argue that appropriate regulations, laws and policies, such as taxes, should be put in place to encourage sustainable activities such as waste management, including taxes on the use of non-renewable resources, landfills and incineration. Weinrich et al, (2024) highlight that current legislation calls for the use of more sustainable packaging, but leaves it up to companies to actually use it.

The interviewees described the lack of an innovation sector, the lack of opportunities and alternatives, the fact that no other competing company is doing it and that it would only be worth it to have a bigger tax drag on the current system as a disincentive to move from the current system to the new one. A disincentive to the new system is thought to be the difficulty of achieving change in the industry, and it is thought that the packaging of products that are more expensive in the first place will be replaced first. The problem at the top of the new system is that this change will make the product itself more expensive. These problems are also noted by Nielsen & Hakala (2023), who note that despite the many technological advances in the industry, manufacturing costs, availability of raw materials and supply problems have often delayed market uptake.

5. CONCLUSION

From the above, it can be concluded that sustainability policies should be designed taking into account systems thinking to encompass the complex dynamics and characteristics of interrelated variables (Chakori et al., 2022). At the firm level, it is important to make changes related to the opportunities that arise from innovation. Firms that recognize these opportunities can enable the spread of sustainable innovation in the plastic food packaging value chain. Sustainable innovation can create new business opportunities for end-of-life service providers. The systemic nature of the diffusion of sustainable innovation requires a strategic and network-based approach by the managers of companies operating in existing value networks. It is important to determine the potential impact of sustainable innovation on a firm's existing and future business activities, and to link it to the impact of innovation on other actors in the network (Keränen et al.,

2021). As the packaging tax mentioned above is an upstream incentive instrument levied on the basis of weight, a tax increase would be more effective if combined with other green design policies or recycling subsidies. A combined approach would encourage companies to use less packaging material at source and to adopt more environmentally friendly packaging alternatives than if they only paid the tax (Afif et al., 2022). Our results show that although companies see the positive benefits of circular economy and alternative packaging, they do not take advantage of these practices. Of particular note is the observation that companies perceive these investments as very costly, but would be willing to open up to them with regulation and support. It can be concluded that in our country, too, the influence of competitors and the difficulty of market situations are strongly present in the case of companies operating in the SME sector. Among the companies interviewed, there were some that are already representatives of the new system and are applying these good practices. However, it is not easy for them because of the immature regulation and the lack of professionals.

REFERENCES

Ada, E., Kazancoglu, Y., Gozacan-Chase, N., & Altin, O. (2023). Challenges for circular food packaging: Circular resources utilization. *Applied Food Research*, 3(2), 100310. doi:10.1016/j.afres.2023.100310

Afif, K., Rebolledo, C., & Roy, J. (2022). Evaluating the effectiveness of the weight-based packaging tax on the reduction at source of product packaging: The case of food manufacturers and retailers. *International Journal of Production Economics*, 245, 108391. doi:10.1016/j.ijpe.2021.108391

Berry, M. (2022). *The Berkana Institute's 'Two Loops*'. Received from: https://www.innovationunit.org/thoughts/the-berkana-institutes-two-loops/

Chakori, S., Richards, R., Smith, C., Hudson, N. J., & Abdul Aziz, A. (2022). Taking a whole-of-system approach to food packaging reduction. *Journal of Cleaner Production*, 338, 130632. doi:10.1016/j.jclepro.2022.130632

Chapman, A., Sen, K. K., Mochida, T., Yoshimoto, Y., & Kishimoto, K. (2024). Overcoming barriers to proactive plastic recycling toward a sustainable future. *Environmental Challenges*, 17, 101040. doi:10.1016/j.envc.2024.101040

Fetting, C. (2020). "*The European Green Deal*", ESDN Report, December 2020, ESDN Office, Vienna. Received from: https://www.esdn.eu/fileadmin/ESDN_Reports/ESDN_Report_2_2020.pdf

Herbes, C., Mielinger, E., Krauter, V., Arranz, E., Hurtado, R. M. C., Marcos, B., et al. (2024). Company views of consumers regarding sustainable packaging. *Sustainable Production and Consumption*, 52, 136–150. doi:10.1016/j.spc.2024.10.018

Jagoda, S. U. M., Gamage, J. R., & Karunathilake, H. P. (2023). Environmentally sustainable plastic food packaging: A holistic life cycle thinking approach for design decisions. *Journal of Cleaner Production*, 400, 136680. doi:10.1016/j.jclepro.2023.136680

Kazancoglu, Y., Ada, E., Ozbiltekin-Pala, M., & Aşkın Uzel, R. (2023). In the nexus of sustainability, circular economy and food industry: Circular food package design. *Journal of Cleaner Production*, 415, 137778. doi:10.1016/j.jclepro.2023.137778

Keränen, O., Komulainen, H., Lehtimäki, T., & Ulkuniemi, P. (2021). Restructuring existing value networks to diffuse sustainable innovations in food packaging. *Industrial Marketing Management*, 93, 509–519. doi:10.1016/j.indmarman.2020.10.011

Kleine Jäger, J., & Piscicelli, L. (2021). Collaborations for circular food packaging: The set-up and partner selection process. *Sustainable Production and Consumption*, 26, 733–740. doi:10.1016/j.spc.2020.12.025

Nielsen, I. B., & Hakala, H. (2023). External enablers for the circular economy: A case study of the food packaging industry. *Journal of Cleaner Production*, 417, 137915. doi:10.1016/j.jclepro.2023.137915

Tenhunen-Lunkka, A., Balatsas-Lekkas, A., Mouazan, E., Palola, S., Ngo, T., Salo, M., et al. (2024). Implementing a circular business model for reusable packaging: Multidisciplinary learnings from reusable pizza packaging. *Sustainable Production and Consumption*, 48, 62–83. doi:10.1016/j.spc.2024.05.006

Trojanowski, T. (2023). Food companies' innovations in creating sustainable product packaging on the polish market. *Procedia Computer Science*, 225, 720–727. doi:10.1016/j.procs.2023.10.058

Trubetskaya, A., Scholten, P. B. V., & Corredig, M. (2022). Changes towards more sustainable food packaging legislation and practices. A survey of policy makers and stakeholders in europe. *Food Packaging and Shelf Life*, 32, 100856. doi:10.1016/j.fpsl.2022.100856

Weinrich, R., Mielinger, E., Krauter, V., Arranz, E., Camara Hurtado, R. M., Marcos, B., et al. (2024). Decision-making processes on sustainable packaging options in the european food sector. *Journal of Cleaner Production*, 434, 139918. doi:10.1016/j.jclepro.2023.139918

European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste Received from: https://eur-lex.europa.eu/legal-content/HU/TXT/?uri=celex%3A31994L0062

Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment Received from: https://eur-lex.europa.eu/legal-content/HU/ALL/?uri=CELEX%3A32019L0904