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THE ROLE OF SUSTAINABLE DEVELOPMENT IN E-CONSUMERS' AWARENESS

Justyna MAJCHRZAK-LEPCZYK
Hipolit Cegielski State
University of Applied Sciences in Gniezno, Poland
E-mail: j.majchrzak-lepczyk@ans.gniezno-edu.pl
ORCID ID: 0000-0002-6729-8409

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Abstract. *In the face of escalating global environmental challenges and evolving societal attitudes, the importance of sustainable development in e-commerce is growing [Islam et al., 2022]. The purpose of this study is to analyze the impact of e-consumers' ecological awareness on their purchasing decisions – especially regarding the delivery of products bought online – and to assess to what extent sustainable development aspects genuinely shape purchasing preferences, and to what extent they remain a declarative value. The research focuses on key areas such as the choice of eco-friendly packaging, delivery time, preferences for shipping methods, propensity for returns, and increasing interest in second-hand purchases. The study results will enable determining whether consumers genuinely modify their purchasing habits to include pro-ecological aspects, and will also help identify barriers hindering the broader implementation of sustainable development principles in e-commerce. The article thus contributes to the discussion on the future of e-commerce in the context of environmental responsibility and long-term consumer trends.*

Keywords: *e-commerce, ecological awareness, returns, sustainable development, packaging, parcel lockers*

Introduction

Sustainable development is a term widely used in literature, legal acts, and strategic documents of many entities. The most frequently cited definition of sustainable development is the one developed by the Brundtland Commission in 1987, which defines sustainable development as "...development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" [Eur-lex, 2025]. Sustainable development has become a significant element of business strategies, translating into conducting business in a way that meets the current needs of the company and its stakeholders, while simultaneously protecting the natural environment and providing resources for future generations [Purvis, Mao & Robinson, 2019]. The Corporate Social Responsibility (CSR) model plays a crucial role in this process. Thus, sustainable development and corporate social responsibility are among the key challenges for contemporary companies. By addressing these, businesses can not only achieve economic success but also contribute to building a better future.

Among other things, the growing needs related to environmental protection have become a premise for modifying the market offer of logistics service providers towards solutions that are not only economically efficient but also environmentally responsible. Understanding ecological issues and meeting the demands of a growing group of environmentally conscious consumers pose a significant challenge for businesses.

Transport accounts for the largest share of environmental pollution. According to the "European Green Deal", a revision of CO_2 emission standards for passenger cars and vans is being considered. Average CO_2 emissions from new passenger cars and vans registered in the EU will have to be 37.5% lower in 2030 compared to 2021 limits (95 g CO_2/km) [European Parliament, 2025]. For new vans, the reduction target is 31% by 2030 (compared to 147 g CO_2/km in 2021). A special incentive mechanism aims to accelerate the introduction of zero-

emission and low-emission vehicles to the market. Thus, reducing the negative impact on the environment is becoming one of the greatest challenges facing humanity.

The increase in global environmental challenges and changing social attitudes mean that sustainable development is becoming a key factor influencing business strategies, including e-commerce. The e-commerce sector, dynamically developing on a global scale, faces the challenge of reconciling the convenience of online shopping with environmental aspects. In the face of growing ecological awareness among consumers, companies are implementing various solutions aimed at minimizing negative environmental impact, including eco-friendly packaging, low-emission deliveries, and transparency regarding product origin, among others.

Despite increasingly frequent declarations from consumers about preferring sustainable solutions, the question still arises whether these genuinely translate into concrete purchasing decisions. This article will present considerations that either refute or confirm this thesis. The study is review-analytical in nature. It is based on the analysis and synthesis of available data from industry reports of selected European countries, with an emphasis on Poland, as well as scientific publications. Key consumer decision-making factors were considered, such as the choice of eco-friendly brands, preferences for eco-friendly packaging, handling returns, and the choice of delivery methods for ordered products. By analyzing available reports, including Gemius "E-commerce in Poland 2023" and "E-commerce in Poland 2024" and others, efforts were made to examine the actual impact of consumers' ecological awareness on their choices.

Ecological Awareness of E-Consumers

It is important to emphasize that ecological action is no longer just a trend but a necessity-especially in the context of the 2022 EU directive, CSRD (Corporate Sustainability Reporting Directive). This directive obliges companies to report on ESG (Environmental, Social, and Governance) performance. In the EU, the transport and storage sector accounts for a substantial share of greenhouse gas emissions, dominated by road transport at nearly 70%. E-commerce activity has a significant environmental impact, particularly in the area of last-mile delivery (door-to-door). The EU aims to reduce CO_2 emissions by 55% by 2030. It is therefore not surprising that courier companies are increasingly focusing on environmental aspects. Similar trends are observed among e-commerce customers.

According to the E-Chamber report [2024], 86% of respondents are willing to wait longer for a combined shipment of all ordered products if it is delivered in an eco-friendly manner. Additionally, 6 out of 10 respondents view returns negatively in terms of their environmental impact. Concerns also arise regarding purchases from Asian platforms - 66% of internet users perceive them as harmful to the environment. Meanwhile, 42% of consumers pay attention to whether the product is packed in an eco-friendly way, and nearly 47% are willing to pay extra for sustainable packaging. Reuse of packaging is important to 39% of respondents. These data highlight a growing awareness among customers and a willingness to embrace more sustainable solutions.

A report commissioned by the Mondi Group [2025] shows that sustainability significantly influences packaging preferences and online shopping behavior across Europe. Among 6,000 consumers surveyed, eco-consciousness plays a vital role - particularly in Scandinavian countries, where consumers are most engaged in choosing sustainable options (Table 1). All countries in the study reported an increase in interest in eco-friendly packaging compared to the previous year.

Table 1. Comparison of Trends in Selected European Countries (2024 vs. 2023)
Source: [Mondi, 2025]

Country	Preference for eco-friendly packaging (2024)	Change from 2023
Germany	82%	+6 p.p.
France	78%	+4 p.p.
Poland	73%	+5 p.p.
Sweden	85%	+7 p.p.
Czechia	76%	+5 p.p.

Furthermore, research conducted by AMS SmartOOH [2024] indicates that as many as 86% of Poles expect companies to engage in pro-ecological activities. Moreover, consumers are also willing to pay more for products from brands that operate responsibly. These declarations provide important information for companies that sustainable development has a clear impact on brand value, enhancing its market position. According to Gemius reports, in 2023 [2023], 68% of Polish consumers declared paying attention to ecological aspects of online shopping, while in 2024, this number increased to 73%. A similar trend is observed in Europe - in Germany, 82% of consumers prefer ecological packaging, and in Sweden, 85%, but promotions and price still have a decisive impact on purchases.

One of the key trends is the shift towards more ecological delivery methods. In 2024, according to Gemius research, 81% of Polish consumers choose Paczkomat's as a pick-up method, which minimizes the carbon footprint of transport [Majchrzak-Lepczyk, 2023]. There is a clear increase in the popularity of parcel lockers for both deliveries and returns. InPost has become a leader among courier companies, and more and more companies are using eco-friendly packaging, which responds to growing consumer expectations (Table 2).

Table 2. Summary regarding ecological online shopping preferences in Poland
Source: [Gemius, 2023; Gemius, 2024]

Category	2023	2024
Preferred delivery method	Paczkomat (78%)	Paczkomat (81%) (+3 p.p.)
Most frequently chosen courier	DPD (35%), InPost (33%)	InPost (45%) – new leader
Returns – preferred method	Return by courier (40%), parcel lockers (30%)	Parcel lockers (36%) (+6 p.p.)
Eco-friendly packaging	55% of companies declare its use	61% of companies declare its use (+6 p.p.)

Category	2023	2024
Impact of ecology on delivery choice	68% of consumers pay attention to ecological options	73% of consumers pay attention to ecological options (+5 p.p.)

Eco-friendly packaging is one of the main tools companies use to reduce environmental impact. In 2024, 61% of companies declared its use. Product returns, on the other hand, regardless of the chosen method, always generate an additional carbon footprint associated with transport and the consumption of packaging materials [Barman, 2025]. Although Gemius reports [2023, 2024] do not analyze in detail the impact of ecological awareness on return decisions, actions related to consumers' growing interest in more sustainable return options (e.g., shipment consolidation, returns to pick-up points instead of by courier) are observed. It can therefore be assumed that consumers, especially those with high ecological awareness, may be willing to make certain compromises in convenience if it helps reduce the negative environmental impact. Although a significant group of consumers declares a willingness to use returnable packaging, their actual use may be significantly lower.

Research conducted by Gemius [2024] shows that the most important issue related to ecological delivery methods and the possibility of returning goods is the use of ecological packaging (indicated by 2/3 of respondents), followed by the possibility of using reusable packaging (Chart 1). Carbon footprint issues and transport by electric vehicles are perceived by respondents as less important.

Interest in used products as an alternative to buying new products is growing among consumers. 61% of consumers in Poland make second-hand purchases, with the most popular categories being clothing (79%) and books and films (71%) [Gemius, 2024]. What should be clearly emphasized is the fact that for the first time, the category of second-hand online purchases (re-commerce) appeared in the Gemius report. This confirms the upward trend in used product purchases. The latest Gemius report [2024] shows that as many as 50% of second-hand product buyers describe their financial situation as "good" which is a very important piece of information. Buying used products is no longer frowned upon. Customers appreciate quality, as a product that will last for years can be bought at a good price.

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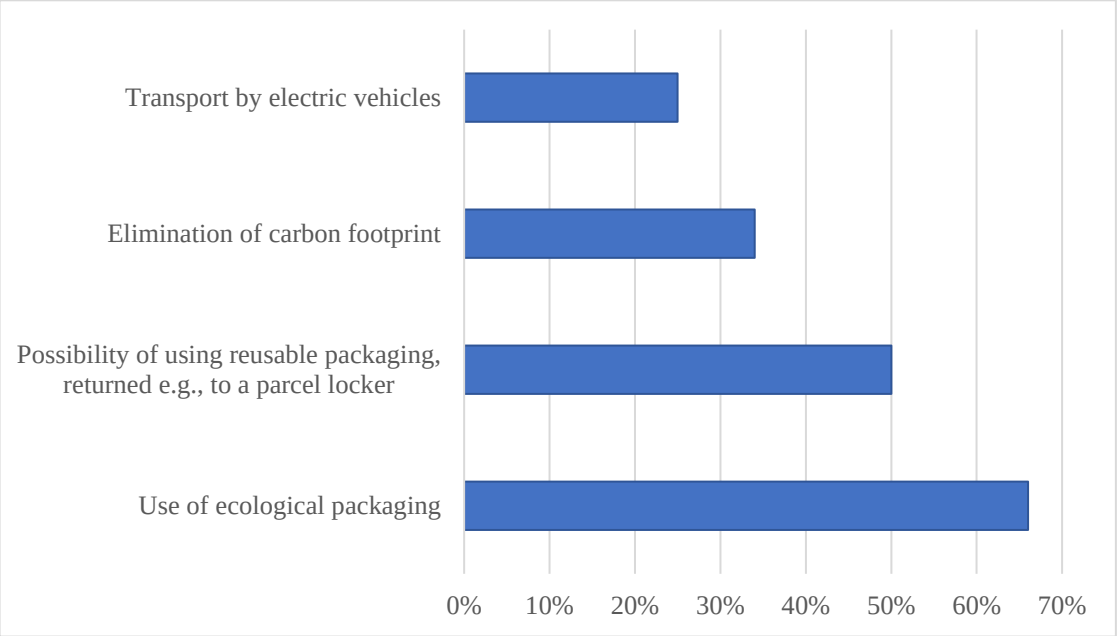

Chart 1. Most important areas related to ecological delivery/return method[1]
Source: [Gemius, 2024]

However, the most important area is the growing awareness of climate change and the negative impact of mass-produced products. This shows a growing interest in purchasing used products, indicating increased ecological awareness among consumers [Yao, 2024]. Companies are adapting to these trends by offering more ecological delivery options and recycled products.

E-commerce Company Strategies for Sustainable Development

E-commerce companies are increasingly investing in green logistics, implementing low-emission deliveries, promoting order pick-up at points, and optimizing courier routes using artificial intelligence. Simultaneously, the importance of ecological packaging is growing – businesses are using recycled materials, reducing plastic, and encouraging customers to reuse packaging. Transparency also plays a significant role, as companies provide detailed information on product origin and ecological certificates, and some implement blockchain technology to track the supply chain [Karakas, Acar & Kucukaltan, 2021; Aslam, Lai, Al Hanbali & Khan, 2025].

Platforms enabling the sale and exchange of used products are becoming increasingly popular, aligning with the circular economy model. Research conducted by Mediapanel [2025] shows that in Poland, Vinted recorded the longest participant engagement time in the first quarter of 2025, which may confirm a growing interest in re-commerce purchases. From its inception, Vinted has positioned itself as a platform supporting sustainable consumption and circularity in fashion. The company successfully leverages consumers' growing interest in a responsible approach to shopping by creating an intuitive, mobile interface and efficient search algorithms. The entire sales and purchase process has been maximally simplified. The implementation of technological innovations, such as smart warehouses or tools for measuring carbon footprint, allows companies to more effectively achieve sustainable development goals.

[1] Basis for percentage calculation: persons who rated the importance of the impact of the delivery and return method on the environment as 4 or 5 (important or very important) (N=493).

Thus, e-commerce companies are increasingly adapting their operational processes to the growing ecological expectations of consumers.

Unfortunately, consumers, despite their declared concern for the environment, often make purchasing decisions based on price [Štofejová et al., 2023]. European ProCarton research indicates that 64% of consumers choose environmentally friendly products only when their price is equal to conventional alternatives [Chimczak-Bratkowski, 2025]. Innovations in sustainable packaging should therefore go hand in hand with cost optimization. In response to this problem, companies are implementing loyalty programs where consumers can get discounts for choosing environmentally friendly products. Additionally, the importance of education is growing – businesses publish ESG reports to promote conscious shopping.

An ideal example is InPost, as one of the leaders in e-commerce logistics in Europe [Majchrzak-Lepczyk, 2024]. The innovative solutions implemented by the company aim to reduce CO_2 emissions and increase delivery efficiency. The company focuses on automating logistics processes, minimizing environmental impact, and promoting ecological consumer choices. The company has developed a decarbonization strategy, consistent with the goals of the Paris Agreement, aiming to achieve net-zero emissions by 2040 [Inpost, 2025]. As part of this strategy, the company:

- Monitors and reduces greenhouse gas emissions in three scopes: direct operational emissions, energy-related emissions, and emissions across the entire value chain.
- Implements electric delivery vehicles, which reduce the carbon footprint of transport.
- Optimizes logistics processes to reduce the number of trips and increase delivery efficiency.

One of InPost's key solutions are Paczkomat's, which significantly reduce CO_2 emissions compared to traditional courier deliveries. This allows consumers to pick up parcels at a convenient time, reducing the number of failed delivery attempts and additional trips. Parcel lockers consume less energy than traditional distribution centers, which aligns with the strategy of reducing energy consumption. Currently, the company has 25,000 Paczkomat's located in Poland, as well as 1,300 electric vehicles. The company continues to invest in further developing the Paczkomat's network to increase their accessibility and reduce delivery-related emissions. As part of this strategy, the company:

- Publishes reports on CO_2 emissions and progress in achieving climate goals.
- Collaborates with business partners to promote ecological solutions throughout the supply chain.
- Introduces technological innovations that support sustainable development, e.g., intelligent logistics management systems.

InPost consistently implements innovative solutions that contribute to the sustainable development of e-commerce. Through its decarbonization strategy, Paczkoamt's, eco-returns (sent without the need to print labels), and transparent ESG reporting, the company not only minimizes its environmental impact but also educates consumers and business partners on ecological choices. Other examples of innovative solutions include the use of tools to calculate the carbon footprint of purchases, which help consumers understand their environmental impact.

Despite the growing importance of social responsibility, both among consumers and companies, the "Responsible E-commerce 2024" report [Izba Gospodarki Elektronicznej, 2024] indicates challenges facing the e-commerce industry. Trust, cybersecurity [Guzenk, 2024], and willingness to invest in an ecological future are key areas influencing further market development. The results cited indicate that consumers' ecological awareness is growing, but their purchasing decisions are often dependent on convenience and price. Companies are

implementing sustainable development strategies, but their full implementation requires further education and changes in consumer habits. The future is shaped by the continued need to promote ecological products and solutions and to implement technologies enabling more sustainable e-commerce.

Consumer Behavior and Sustainable Practices in E-commerce

Growing ecological awareness among consumers is increasingly visible, yet studies reveal a significant discrepancy between declared attitudes and actual purchasing choices. Consumers often express a willingness to purchase environmentally friendly products, but in practice, their decisions are strongly determined by convenience, price, and habits [Oláh et al., 2023]. This discrepancy poses a key challenge for sustainable e-commerce, requiring an analysis of barriers and motivators influencing consumer behavior.

Therefore, the following challenge areas should be identified:

- Economic costs - ecological products are perceived as more expensive. Although some offer long-term savings, the higher initial cost is a barrier, especially for households with limited budgets [Štofejová et al., 2023; Chimczak-Bratkowski, 2025].
- Lack of convenience - choosing sustainable products often involves greater effort and less availability. Consumers may encounter difficulties finding ecological alternatives in local stores or online.
- Skepticism and lack of trust - consumers may be skeptical of companies' ecological claims, fearing greenwashing [Feghali, Najem & Metcalfe, 2025; Mazur i Wierzbicka, 2022]. Lack of transparency in supply chains and difficulty in verifying the authenticity of ecological certificates can undermine consumer trust.
- Power of habits and social norms - entrenched consumer habits and social norms promoting consumption hinder the change towards more sustainable behaviors. Consumers often choose products that are popular and widely socially accepted, even if they are not ecological [Linder, Giusti, Samuelsson & Barthel, 2022].
- Lack of information and education - many consumers lack sufficient knowledge about the environmental impact of their purchasing decisions. The absence of clear and easily accessible information on the ecological aspects of products makes it difficult to make informed choices.

Thus, in view of the above barriers, motivators for changing non-ecological behaviors among customers should be sought. Among them, the following can be indicated:

- Increased ecological awareness - growing awareness of the impact of consumption on the natural environment can prompt consumers to seek more sustainable options. Educational and social campaigns play a key role here in raising awareness and motivation.
- Personal values - consumers who identify with ecological values are more likely to choose products, services, and solutions consistent with their beliefs. Companies can build customer loyalty by communicating values and engaging in environmental protection activities.
- Social influence - consumers are susceptible to their social environment, as knowing that their friends, family, or other groups are engaged in sustainable practices makes them more likely to imitate their behavior.
- Innovation and availability of sustainable products - technological development and innovations in ecological products and services increase their availability and

attractiveness to consumers. Companies that offer innovative and competitively priced sustainable alternatives have a better chance of attracting customers.

- Policy and regulations - government regulations, such as eco-taxes, bans on harmful substances, or packaging standards, can effectively promote sustainable consumption.

Undoubtedly, modern technologies play a very important role in transforming e-commerce towards sustainable development. Artificial intelligence (AI) and blockchain technology offer innovative solutions that not only improve operational efficiency but also increase transparency, build consumer trust, and support ecological practices [Hina, Islam & Dhir, 2024].

In conclusion, the gap between declared values and actual consumer behavior remains a significant challenge for the development of sustainable e-commerce. Habitual purchasing patterns, social norms favoring consumption, and a lack of transparent information about the environmental impact of products can limit the effectiveness of pro-ecological actions. Understanding these barriers – both psychological and structural – is a necessary condition for implementing effective strategies to change consumer attitudes. At the same time, the growing potential of innovative technologies, such as artificial intelligence (AI) and blockchain, offers new possibilities for building more transparent and efficient online sales systems. AI can support personalization and consumer education, predict purchasing preferences, and promote products consistent with the idea of sustainable development. Blockchain, in turn, increases the transparency of supply chains, authenticates manufacturers' declarations, and strengthens consumer trust by allowing traceability of product origin and environmental impact. Integrating these technologies with educational activities and designing the consumer experience in an ecological spirit can significantly contribute to reducing the distance between awareness and action. As a result, it is precisely the combination of consumer insights with appropriately implemented technological solutions that can form the foundation for a more sustainable and responsible e-commerce in the future.

Conclusions

Consumer ecological awareness in e-commerce is growing, but its influence on actual purchasing decisions remains limited. There is a gap between declarations and actions – consumers increasingly emphasize the importance of ecology, but when choosing products, they are guided by other criteria, often price, convenience, and availability. E-commerce companies, aware of the growing interest in sustainable development, are implementing strategies aimed at reducing CO_2 emissions, limiting waste, and improving operational transparency. InPost, as an example of an innovative approach in Poland and beyond, is developing its Paczkomat's network, investing in low-emission logistics, and implementing solutions supporting ESG reporting.

On an international scale, the role of technologies such as artificial intelligence and blockchain is also growing, as they allow for supply chain optimization, increased transparency of ecological certificates, and consumer education. These technologies also help overcome barriers related to costs, convenience, or skepticism towards company declarations. Purchasing behaviors are changing dynamically, and a key trend is the growing popularity of second-hand purchases, which indicates increasing acceptance of more sustainable consumer practices. At the same time, the importance of returns is growing, which can negatively impact the environment if appropriate mechanisms to limit them are not implemented.

Sustainable development in e-commerce is becoming one of the most important challenges and simultaneously opportunities for contemporary businesses and consumers. E-commerce companies, in response to these challenges, should implement a range of strategies supporting sustainable development, invest in green logistics, ecological packaging, supply chain transparency, and loyalty programs promoting pro-ecological choices. Consumer education, through ESG reports and information campaigns, plays a huge role. The future of sustainable e-commerce depends both on the further development of innovative solutions and on changes in consumer attitudes. Education, transparency, and business cooperation are essential for ecology to become a real selection criterion, not just a declaration. Only by combining efforts on all these levels will it be possible to build an e-commerce market that is not only modern but also socially and environmentally responsible.

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